

An Assessment of Socio-Economic Determinants of the Reach of PM Ujjwala Yojana: A Study of Longai Valley in Sribhumi District of Assam

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ABSTRACT

The present study is intended to analysis of the fuel consumption pattern in rural households of Longai Valley T.E. with special reference to the priority concerns of PMUY. PMUY has increased access to LPG but high cost of refills (81.02%) and subsidy withdrawal act against sustained usage. A regression analysis reveals age, housing status and education have a positive impact on adopting LPG, but larger family size and economic stress favour the continued use of traditional fuels. Women's empowerment and better sanitation are associated with the uptake of cleaner fuel. PMUY is a major success in the country; however, affordability and awareness differences mean many households are still using firewood. Policy implications involve selective subsidies, public awareness campaigns, and infrastructure building. Improvement in literacy and promotion of woman participation in economic activities could promote usage of LPG which may in turn reduce risks to health and environment. In tea garden communities, addressing social inequities and ensuring access to clean energy, as well as basic facilities, is essential for sustainability development. Policy based on evidence is crucial if progress is to be fair.

Keywords: PMUY, Women's Empowerment, Sustainable Development, Clean Energy JEL:C13, D1, C21, I38, J78, R28

INTRODUCTION

India, despite its economic advancements, still had around 10 crore household's dependents on fossil fuels like firewood, coal, kerosene, and biomass for cooking as of 2016. This heavy reliance on unclean fuels led to serious indoor air pollution, especially affecting women and children. Prolonged exposure to smoke from such fuels caused respiratory diseases and was likened to smoking 400 cigarettes per hour. WHO estimated around five lakh deaths annually due to this issue. Moreover, women and children bore the burden of collecting these fuels, reinforcing social exclusion, particularly among rural and landless populations.

In response, the Government of India launched the Pradhan Mantri Ujjwala Yojana (PMUY) on May 1, 2016, in Ballia, Uttar Pradesh. The scheme aimed to provide free LPG connections to women from Below Poverty Line (BPL) households, improving their health and reducing drudgery. The initial goal was to provide 5 crore connections, later revised to 8 crore by March 2019, and further expanded under Ujjwala 2.0 in 2021 to add an extra 1.6 crore connections.

Each eligible household received a deposit-free LPG connection, financial assistance of Rs 1,600, and a free stove and first refill. Beneficiaries were identified using SECC 2011 data, and connections were issued in the name of the female head of the family. Public sector oil companies — IOCL, BPCL, and HPCL — were tasked with implementation.

The scheme was complemented by other policy reforms, like Direct Benefit Transfer of LPG subsidy (DBTL) and the “Give-it-up” campaign, which encouraged wealthier consumers to surrender subsidies. These measures helped remove fake beneficiaries and saved approximately USD 6.3 billion, enabling the funding of PMUY.

The impact of the scheme has been transformative. By March 2023, India saw a jump in LPG connections from 14.52 crore in 2014 to 31.36 crore, raising national LPG coverage from 62% in 2016 to over 104% in 2022. PMUY contributed significantly to this growth, with 9.58 crore connections released as of early 2023. States like Uttar Pradesh, West Bengal, Bihar, Madhya Pradesh, and Rajasthan saw the highest number of beneficiaries, especially among SC/ST categories (35.1%).

To make LPG more accessible, 5-kg cylinders were introduced for economically weaker sections. Under the Pradhan Mantri Garib Kalyan Package, over 14 crore free LPG refills were distributed during the COVID-19 pandemic. Additionally, a Rs 200 subsidy per 14.2 kg cylinder was approved for PMUY users for up to 12 refills annually.

Per capita LPG consumption among PMUY beneficiaries increased from 3.01 to 3.66 refills between 2019–2022. The scheme has also created employment for about one lakh people in the LPG distribution network. According to WHO, over 37 million women have benefitted from the initiative, marking a significant step toward clean energy access, women’s health, and environmental sustainability in India.

In the present study, we present a brief overview of literature on the impact of clean and green fuel on household wellbeing on one hand and the health hazards of the use of dirty and unsustainable fuels for domestic cooking on the other.

The Pradhan Mantri Ujjwala Yojana (PMUY) has significantly increased access to clean cooking fuel, benefiting over 70 million women across India (Pachauri & Bailis, 2021). The scheme, launched to curb indoor air pollution and empower women, has been praised for its well-structured implementation, which includes subsidies credited directly to Jan Dhan accounts, interest-free loans, and extensive promotional efforts (Sahoo et al., 2018). Studies highlight the role of PMUY in reducing reliance on firewood, with notable declines in solid fuel usage observed in rural areas (Ranjan & Singh, 2020). However, despite the expansion of LPG access, challenges remain, including affordability issues, high refill costs, and inconsistent usage patterns among beneficiaries (Gupta et al., 2020; Kar et al., 2019). Several analysts suggest that while PMUY has successfully increased enrolment, sustained LPG adoption is lagging, as many households continue to rely on traditional biomass fuels for cooking (Gill-Wiehl et al., 2020; Swain & Mishra, 2020). Economic constraints, limited awareness, and gender norms further hinder the transition to exclusive LPG use (Malakar et al., 2018). A study by Singh & Choudhary (2022) found that access to LPG has reduced the drudgery of firewood collection, enabling women to engage in economic activities and enhancing their role in household decision-making. Similarly, Rajput & Mishra (2021) observed improved women's health metrics and increased participation in community affairs. However, regional disparities persist, with certain states exhibiting lower adoption rates due to supply-chain inefficiencies and cultural inclinations towards traditional fuels (Swain & Mishra, 2020). International comparisons by Suzuki et al. (2023) show that similar initiatives have triggered broader social transformations, empowering women beyond household responsibilities. Aggarwal et al. (2018) proposed a Decision Support System (DSS) to track real-time implementation, emphasizing the need for dynamic policy interventions to promote consistent LPG usage. Other studies advocate for mid-course corrections, such as increased subsidies, awareness campaigns, and doorstep delivery to improve refill rates (Dabadge, 2018; Sharma et al., 2019). In Tamil Nadu, for instance, PMUY has contributed to an LPG coverage rate of 97.9%, yet a significant proportion of households still engage in fuel stacking, highlighting the need for additional behavioural incentives (Akileish, 2019). Swain & Mishra (2019) found that education and subsidy availability play crucial roles in LPG adoption, with higher-educated households transitioning faster. Furthermore, economic studies highlight that LPG usage is influenced by per capita expenditure, demonstrating a strong correlation between income levels and energy transition (Kapsalyamova et al., 2021). The findings underscore that while PMUY has made remarkable strides in enhancing energy accessibility, further efforts are needed to ensure sustained adoption, affordability, and behavioral shifts to fully realize the benefits of clean cooking fuel. Strengthening distribution channels,

increasing refill subsidies, and incorporating socio-cultural interventions can help bridge the gap between LPG access and consistent usage, fostering long-term energy security for rural India

Several studies are available on the access and reach of the clean and green domestic cooking fuel in rural as well as urban areas of India and south Asia. Some studies focus on accessibility and effectiveness; other studies focus upon impact of dirty fuel usage on household and women health which are important for household well-being. Although the reach, effectiveness and impact of LPG penetration in traditional fuel using households of rural tea garden areas of Assam is untouched especially in the context of PM Ujjwala scheme. The exact dynamics behind how adoption of the LPG by traditional dirty fuel users can empower household women is yet to be reported for Southern Assam.

Objectives of the Study

1. To examine the patterns and socio-economic determinants of fuel usage for domestic cooking in rural households of Longai Valley T.E.
2. To have comparative analysis of fuel usage patterns for domestic cooking in households of major tea gardens of Longai Valley T.E.
3. To assess the success of PMUY in tea gardens of Longai Valley T.E.

Research Questions:

1. Socio-economic factors do not influence fuel usage patterns in rural households of Longai Valley T.E.
2. Fuel usage pattern for domestic cooking does not in households of major tea gardens of Longai Valley T.E.
3. PMUY is not successful in tea gardens of Longai Valley T.E.

Methodology of The Study:

The study was covered 230 BPL households after appropriate first stage identification from local government body sources. Total of 5 villages were selected from Longai Valley of Sribhumi (Karimganj) District, specifically focusing on tea garden and ex-tea garden worker concentrations where incidence of absolute poverty was to be higher. The data was collected through personal interviews after physically visiting the chosen households.

This study was undertaken in tea garden dominated villages of Assam, an ethno-linguistic minority, the population of the community was primarily rural in nature and estimated to be around 7 million (70 lakhs), or nearly 20% of Assam's total population. They were lived in almost every district of Assam, but their density varies according to the number of tea plantations in different regions of Assam. They form nearly 11% of the total population in the Barak Valley region of Assam (https://en.wikipedia.org/wiki/Tea-garden_community). A brief note on the study area was as follows:

Sribhumi district is one of the southernmost districts of Assam located in the valley of Barak. The total area of the district is 1809 square km. The terrain of the district consists of flood plains, wetlands, hills and forests. The district is surrounded by Bangladesh and Cachar district of Assam in the north, Mizoram in the south, Bangladesh and Tripura in the west and Hailakandi district of Assam in the east. The district comprises of just one subdivision which is also named Sribhumi. The district has five revenue circles namely Karimganj, Badarpur, Nilambazar, Patherkandi and Ramkrishnanagar and seven development blocks. There are three census towns and 915 inhabited villages in the district. As per the data of Directorate of Tea Tribes and Adivasi Welfare, Government of Assam there are 23 tea gardens in Karimganj district of Assam (<https://ttwd.assam.gov.in/frontimpotentdata/list-of-tea-garden-at-assam>) out of which the study will be conducted in tea estates namely: Baithakhal Tea Estate, Bidyanagar Tea Estate, Chargola Tea Estate, Goombhira Tea Estate, Longai Tea Estate and Patini Tea Estate, which are located in South Assam. This is one of the tea gardens established by the British

in Barak Valley. During the British Period most of these gardens were managed by private company, but now it is managed by Assam Tea Corporation. These gardens have their own tea producing factory since the British period. The workers of the garden are from different states of the country in origin, as their forefathers were employed from different states of India. Even after so many years of independence residents of these garden areas, especially the tea garden labourers lack basic infrastructure facilities in the form of primary schools, primary health centre daily market, pharmacy and road transport system till for these facilities the inhabitants are to go to near villages (Sinha et al, 2023).

This study was to use standard descriptive statistics such as frequency distribution, arithmetic mean, etc. Simple graphic tools along with correlation, ordinary least squares, (regression model) to identify the factors affecting usage of LPG in tea garden dominated areas of Longai Valley, Assam and to investigate the socio-economic causes behind selection of forest and other non- cooking fuel for domestic cooking.

RESULT AND DISCUSSION

Socio-Demographic Characteristics of the Respondents:

This section presents some social and demographic characteristics of the respondents of Longai Valley area. The results are presented in tabular format and figures.

Table 1. Social and Demographic and Economic Features of the Respondents (n=137)	
Variables	Average $\pm$ Standard Deviation
Age (Years)	38.15 $\pm$ 9.92
Family Members	6.39 $\pm$ 2.33
Average Monthly Expenditure (in Rs)	14750.00 $\pm$ 9637.69
Average Years of Schooling (Years)	3.21 $\pm$ 3.16
Average Number of Rooms (Nos)	1.92 $\pm$ 0.81

Source: Calculated based on field survey

Above table gives tabular representation of some social economic and demographic features of the respondents. It is clear from the table that the average age of the respondents is 38.15 years that is the respondent women are mostly young. On an average respondent have 6.39 numbers of family members. Average monthly expenditure of the respondents is Rs. 14750.00.

Table 2. Social and Demographic Features of the Respondents (n=137)	
Variables	Percentage
Religion:	
(a) Hindu	74.45 (n=102)
(b) Islam	23.36 (n=32)
(c) Christian	2.19 (n=3)
Caste:	
(a) SC	62.77 (n=86)
(b) ST	8.76 (n=12)
(c) OBC	25.55 (n=35)
(d) General	2.92 (n=4)
House Type:	
(a) Kaccha	28.00 (n=38)
(b) Pakka	44.53 (n=61)
(c) Semi-pakka	28.00 (n=38)
Toilet Type:	

(a) Kaccha	63.50 (n=87)
(b) Pakka	32.85 (n=45)
(c) Semi-pakka	3.65(n=5)
Kitchen a separate room detached from main house:	
(a) Yes	61.31 (n=84)
(b) No	38.69(n=53)

Source: Calculated based on field survey

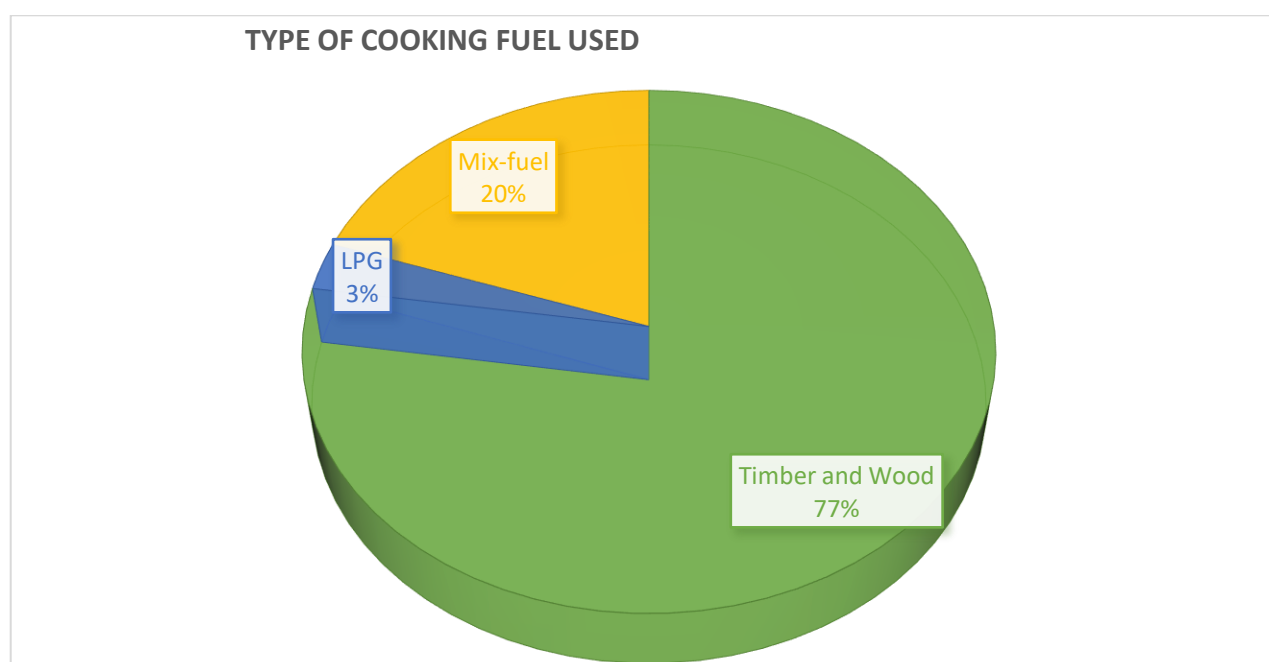
Table 2 shows some socio-economic characteristics of the respondents. It is clear from the table that among the respondents 74.45 % are Hindu, and 23.36% are found follow Islam religion, only 2.19% of the respondents are found follow Christian religion. In case of caste, 62.77 % are SC, 8.76 % are ST, 25.55 % OBC and 2.92 % of the respondents are found to be of General category. This indicates that respondents of Longai Valley area are mostly Hindu people belonging to SC category. In case of house type 28.00% are found to live in kaccha and semi-pakka houses in each case. 44.53 % live in pakka houses. In case of toilet also 63.50% have kaccha toilet and 32.85 % has pakka toilet and remaining 3.65% have Semi-pakka toilet. Though this number is good Government need to intervene to provide appropriate services to avail the remaining respondent households good and hygienic living condition. Among the respondents, 61.31% have kitchen a separate room detached from main house, remaining 38.69% do not have a separate kitchen. That is these women are subjected to direct indoor air pollution.

The different sources of drinking water of the respondents in the Longai Valley area. Amongst the respondents 82.48 % that is majority drink water of tube well. 6.57 % drink water of house connection, 0.73% drink pond water and remaining 10% drink water from other sources.

Type of Cooking Fuel Used:

Following figure represents fuel use patterns of households in Longai Valley area.

Figure 2: Type of Cooking Fuel Used



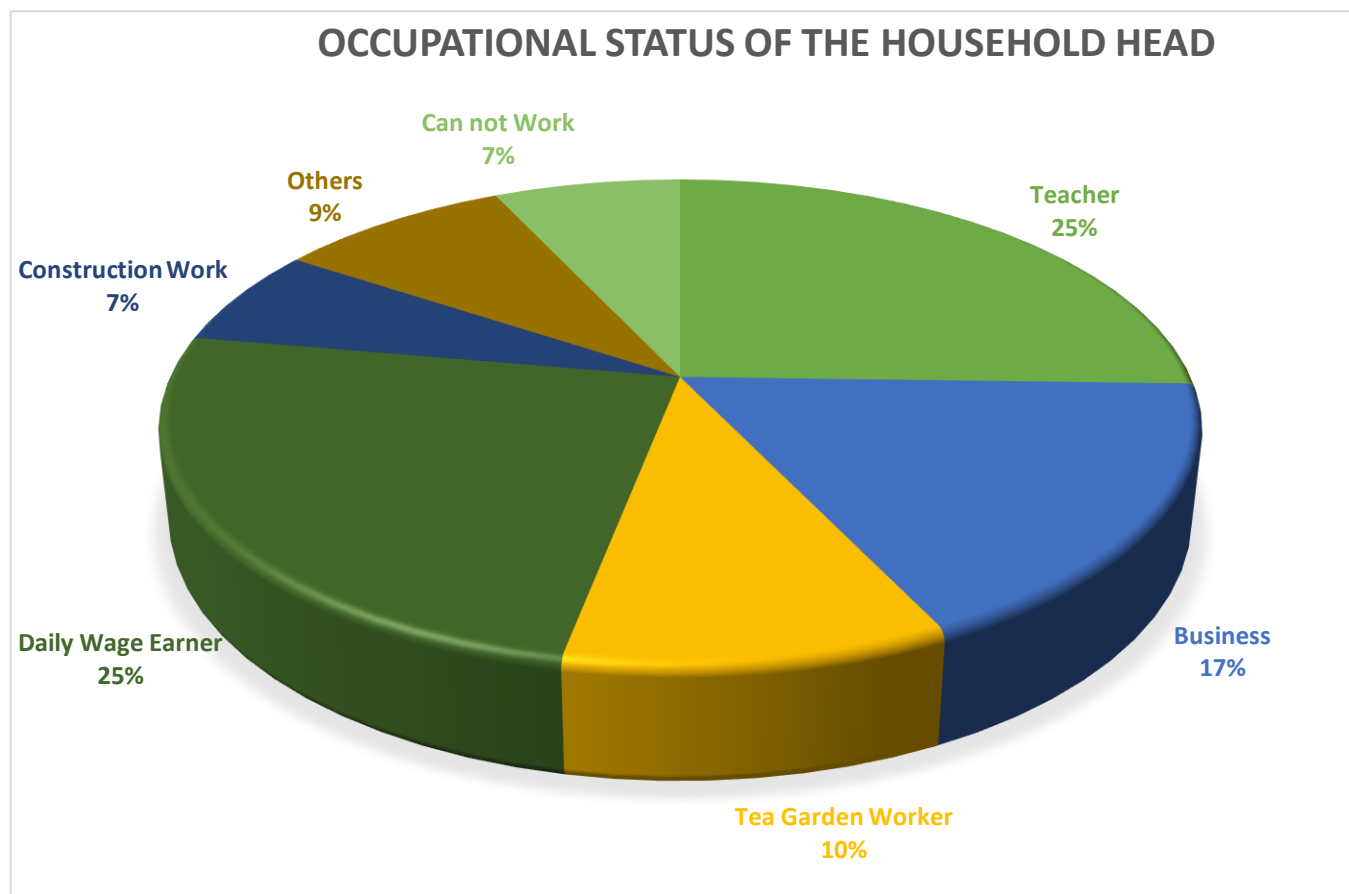
Source: Calculated based on field survey

It is evident from the above figure that majority of the respondents, 77% use Timber and Wood (Non-LPG) as cooking fuel and only 3% use LPG as cooking fuel and remaining 20% mixed fuel pattern that is a combination of both LPG and Wood. This is also a matter of concern since almost 50% amongst the respondents use wood as cooking fuel even after 8 years of implementation of PM Ujjwala Yojana. This may cause hazards in the form of indoor air pollution and destruction of forest cover for collecting firewood for cooking.

Occupational Details of the Household Head:

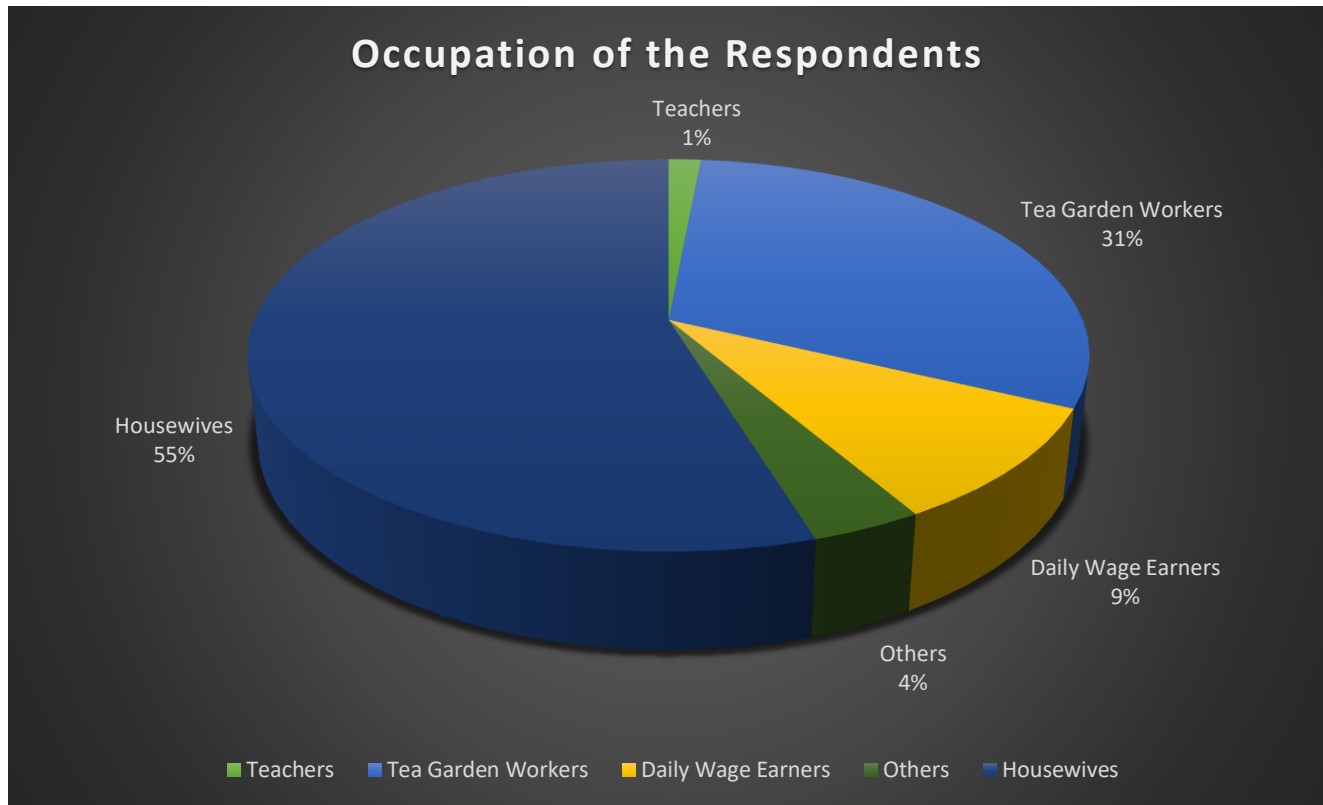
Figures 3(a) and 3(b) below gives detailed view of the occupational details of the respondent household, it is evident from the figure 3(a) that. It is evident from the diagram that in the sample 25% household head are found teachers and daily wage earners each. 17% are businessmen, 10% tea garden workers, 9% are found to have other occupations, 7% of them are found to be construction to workers and also 7% of them are unable to work due to different reasons. Similarly, in figure 3 (b) occupational status of the respondent women is shown. It is clear from the figure that among the 137 respondents 55% are housewives, 31% are tea garden workers, 9% are daily wage earners, 1% are teachers, and 4% are engaged in other occupations. That is majority of the respondents of Longai Valley tea garden area are housewives.

Figure 3(a): Occupational Status of the Household Head



Source: Calculated based on field survey

Figure 3(b): Occupational Status of the Respondent



Source: Calculated based on field survey

Reasons of Using Non-LPG as Cooking Fuel:

Following tables represents the reasons of using Non-LPG as cooking fuel in terms of percentage regression results tabular format.

Table 3(a). Reasons of Using Non-LPG as Cooking Fuel (n=137)	
Variables	Percentage
(a) High Price	81.02 (n=111)
(b) Stopped Subsidy	3.65 (n=5)
(c) High Price and Stopped Subsidy	7.30 (n=10)
(d) High Price, Stopped Subsidy and Fear of Fire	7.30 (n=10)

Source: Calculated based on field survey

Above table represents the reasons stated by the respondents for using Non-LPG as cooking fuel in the study area. It is found that majority of the respondents, 81.02% use Non-LPG because of high price, followed by 7.30% use for High Price and Stopped Subsidy and High Price, Stopped Subsidy and Fear of Fire. Only 3.65% respondents are found to use Non-LPG as cooking fuel because of high price, stopped subsidy and fear of fire in the study area.

Table 3 (b): The Linear Regression Results of Non-LPG Usage Socio-Economic Factors. Dependent Variable: Non-LPG					
Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	1.329**(8.568)	1.022**(9.469)	1.091** (11.618)	1.436 ** (11.318)	1.340**(8.011)

AGE	-0.007**(-2.376)			-0.006**(-2.232)	
CASTE	-0.002(0.933)				
FAMILY MEMBERS	0.017(1.307)	0.022(1.657)			
HHE		-3.930(0.218)	-3.780(-1.163)		
SCHOOLING		0.009(0.339)			
FEMALE			0.042(1.189)		
FEMALE OCCUPATION			-0.003(-0.259)		
LIVING AREA				-2.560(-0.270)	
DW				-0.004(-0.195)	
AREA					0.001 (0.012)
HOUSING CONDITION					-0.121**(-2.940)
TOILET AND SANITATION					0.020(0.364)
WHO COLLECTS					0.005(0.229)
R-Squared	0.055	0.028	0.018	0.042	0.067
Adjusted R-Squared	0.033	0.006	-0.011	0.021	0.038
F-Statistic	2.545*	1.263	0.617	1.957	2.342*
Durbin-Watson	1.171	1.129	1.137	1.171	1.212

Source: Calculated based on field survey

Table 3(b) above represents linear regression results of the determinants of Non-LPG fuel usage in terms of some socio-economic variables. It is evident from the table that only AGE (Age of the respondent) in models 1 and 4 and HOUSING CONDITION (of the respondent) in model 5 are found to have negative and significant relation with Non-LPG fuel usage indicating respondents with higher age are expected to use LPG as cooking fuel compared to women with lower age. Similarly, women living in better housing condition are expected to use LPG as cooking fuel compared to living in poor housing condition. CASTE in model 1 is found to have negative coefficient though insignificant, FAMILY MEMBERS in model 1 and 2 is found to have positive coefficient indicating family with large number of family members are expected to use more NON-LPG as cooking fuel, compared to those with lesser family members. Among other important observations, HHE (Household Expenditure Per Month) in model 2 and 3 is found to have negative coefficient, indicating family spending more on necessary commodities are expected to use or spend on clean fuel in LPG. SCHOOLING in model 2 is found to have positive coefficient indicating women with higher educational qualification is expected to use clean energy as cooking fuel because of improved awareness about the hazards of dirty fuel usage. FEMALE OCCUPATION in model 3 is found to have negative coefficient indicating the more women are engaged in income earning activities are expected to use less dirty fuel, compared to housewives, LIVING AREA, DW (availability of safe drinking water) in model 4 and is found to have negative coefficients and WHO COLLECTS (family members help in cooking fuel collection) in model 5 is found to have positive coefficient indicating women living in somewhat improved living condition in terms of availability safe drinking water and housing condition are expected to use LPG as cooking fuel, but if family members help in collection, they are supposed to use more Non-LPG as cooking fuel.

CONCLUSIONS AND POLICY IMPLICATIONS:

The study provides insights into the socio-economic dynamics of households in the Longai Valley area, highlighting challenges such as limited access to education, basic amenities, and reliance on traditional cooking fuels. Policy interventions should focus on addressing barriers to LPG adoption, including affordability and awareness. Subsidy schemes need to be optimized to reach marginalized communities effectively. Despite initiatives like the PM Ujjwala Yojana, there's still a significant reliance on traditional cooking fuels. Targeted efforts are needed to promote LPG usage, especially among households with better economic conditions and

education levels. Educational attainment correlates positively with LPG usage. Therefore, awareness campaigns on the health and environmental benefits of clean cooking fuels could incentivize adoption. Initiatives aimed at improving education and empowering women can facilitate the transition to cleaner cooking fuels, thereby mitigating health risks and environmental degradation. Infrastructure development, particularly in water and sanitation, is crucial for enhancing living standards and promoting sustainable development in tea garden communities. Continued research and monitoring are essential for tracking progress and refining interventions to ensure inclusive and equitable outcomes for all residents. In conclusion, addressing socio-economic disparities, promoting clean energy adoption, and improving access to basic amenities like water and sanitation are essential for the holistic development of the Longai Valley area. Policymakers should prioritize evidence-based interventions tailored to the unique socio-economic context of the region.

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