

A COMPREHENSIVE ASSESSMENT OF THE AVAILABILITY AND USE OF BIOMASS FUELS FOR VARIOUS END-USES WITH SPECIAL ATTENTION TO POWER GENERATION

Final Report

(Ref: UNDP-BD-CPS-2018-009)



Submitted to
National Project Director
SREPGen Project
Attention: Project Manager, SREPGen Project
UNDP Bangladesh



Submitted by
NATURE CONSERVATION MANAGEMENT (NACOM)

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Rashiduzzaman Ahmed
Director, NACOM

A COMPREHENSIVE ASSESSMENT OF THE AVAILABILITY AND USE OF BIOMASS FUELS FOR VARIOUS END USES WITH SPECIAL ATTENTION TO POWER GENERATION

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ACRONYMS AND ABBREVIATIONS

| | |
|-----------------|--|
| ADB | = Asian Development Bank |
| AE | = Agricultural Expert |
| AFCL | = Annual Forest Cover Loss |
| AIS | = Agricultural Information Services |
| BARI | = Bangladesh Agricultural Research Institute |
| BADC | = Bangladesh Agricultural Development Corporation |
| BAU | = Bangladesh Agricultural University |
| BBDF | = Bangladesh Biogas Development Foundation |
| BBS | = Bangladesh Bureau of Statistics |
| BCAS | = Bangladesh Centre for Advanced Studies |
| BCCSAP | = Bangladesh Climate Change Strategy and Action Plan |
| BCCT | = Bangladesh Climate Change Trust |
| BCIC | = Bangladesh Chemical Industries Corporation |
| BCSIR | = Bangladesh Council of Scientific and Industrial Research |
| BERC | = Bangladesh Energy Regulatory Commission |
| BREB | = Bangladesh Rural Electrification Board |
| BSFIC | = Bangladesh Sugar and Food Industries Corporation |
| BEPP | = Bangladesh Energy Planning Project |
| BES | = Bangladesh Energy Study |
| BF | = Biomass Fuel |
| BFD | = Bangladesh Forest Department |
| BFE | = Biomass Fuel Expert |
| BFIDC | = Bangladesh Forest Industries Development Corporation |
| BFRI | = Bangladesh Forest Research Institute |
| BGF | = Biomass Gain Factor |
| BGDCL | = Bakhraabad Gas Distribution Company Limited |
| BioSNG | = Bio-Synthetic Natural Gas |
| BJRI | = Bangladesh Jute Research Institute |
| BLRI | = Bangladesh Livestock Research Institute |
| BLGCC | = Black Liquor Gasification Combined Cycle |
| BLGMF | = Black Liquor Gasification for Motor Fuels |
| BMDA | = Barind Multipurpose Development Authority |
| BNH | = Bangladesh National Herbarium |
| BPC | = Bangladesh Petroleum Corporation |
| BPDB | = Bangladesh Power Development Board |
| BRAC | = Bangladesh Rural Advancement Committee |
| BRRRI | = Bangladesh Rice Research Institute |
| BSV | = Baseline Stock Volume |
| BSTI | = Bangladesh Standard and Testing Institute |
| BTU | = British Thermal Unit |
| BUET | = Bangladesh University of Engineering and Technology |
| B _{LA} | = Bran from Local Aus |
| BVC | = Bangladesh Veterinary Council |
| CAM | = Conceptual Analytical Model |

| | |
|-----------------|---|
| CAP | = Country Action Plan for Clean Cookstoves |
| CCAC | = Climate and Clean Air Coalition |
| CCTF | = Climate Change Trust Fund |
| CDB | = Cotton Development Board |
| CDM | = Clean Development Mechanism |
| CEGIS | = Center for Environmental and Geographic Information Services |
| Cft/cft | = Cubic Feet |
| CHP | = Combined Heat and Power |
| CHT | = Chittagong/Chattagram Hill Tracts |
| CV | = Commercial Volume |
| CO ₂ | = Carbon dioxide |
| CH ₄ | = Methane |
| D | = Bulk Density of MSW waste in ton/cubic meter |
| DAE | = Department of Agricultural Extension |
| DAM | = Department of Agricultural Marketing |
| D _n | = Other use |
| D ₁ | = Sludge Used in the Sewage Sludge Based Biogas Plant in ton/year |
| DBH | = Diameter at Breast Height |
| DCRMA | = Disaster and Climate Risk Management in Agriculture |
| DESCO | = Dhaka Electric Supply Company Limited |
| DF | = Waste Disposal factor |
| DFO | = Divisional Forrest Officer |
| DFR | = Draft Final Report |
| DFLS | = Districts with Forest Land-use System |
| DLS | = Department of Livestock Services |
| DME | = Data Management Expert |
| DNFLS | = District with No Forest Land-use System |
| DoE | = Department of Environment |
| DPDC | = Dhaka Power Distribution Company Limited |
| DTL | = Deputy Team Leader |
| D ₁ | = Ton of MSW used in the MSW based biogas plant |
| D _n | = Other use |
| EBT | = Energy Balance Tables |
| ef | = Extraction Factor |
| EIA | = The U.S. Energy Information Administration |
| EU | = European Union |
| FAO | = Food and Agriculture Organization of the United Nations |
| FD/BFD | = Bangladesh Forest Department |
| FDC | = Forest Dependent Communities |
| FE | = Forestry Expert |
| FMP | = Forest Management Plan |
| FRA | = Forest Resource Assessment |
| FY | = Fiscal Year |
| GCF | = Green Climate Fund |
| GDP | = Gross Domestic Product |
| GEF | = Global Environment Facility |

| | |
|----------------|---|
| GIAHS | = Globally Important Agricultural Heritage System |
| GIZ | = German development agency |
| GHG | = Green House Gas |
| GJ | = Giga (10 ⁹)Joules |
| GNI | = Gross National Income |
| GOB | = Government of Bangladesh |
| GPS | = Global Positioning System |
| GS | = Grameen Shakti |
| GW | = Gigawatt |
| GWh | = Gigawatt Hour |
| ISWM | = Integrated Solid Waste Management |
| Ha | = Hectare (2.471 acres or 10,000 square meters) |
| HES | = Households Expenditure Survey |
| HF | = Hortex Foundation |
| HIES | = Household Income & Expenditure Survey |
| HH | = Households |
| HHK | = Hybrid Hoffman Kiln |
| HYV | = High Yielding Variety |
| H ₂ | = Hydrogen |
| ICS | = Improved Cook Stove |
| IEA | = International Energy Agency |
| IDCOL | = Infrastructure Development Company Limited |
| IDRC | = International Development Research Foundation |
| IPCC | = Intergovernmental Panel on Climate Change |
| IUCN | = International Union for Conservation of Nature |
| IUT | = Islamic University of Technology |
| IW | = Industrial Waste |
| JGTDSL | = Jalalabad Gas Transmission and Distribution Systems Ltd. |
| JICA | = Japan International Cooperation Agency |
| KfW | = Kreditanstalt für Wiederaufbau ("Credit Institute for Reconstruction"). |
| KG | = Kilogram |
| kgoe | = Kilogram of Oil Equivalent |
| KGDCL | = Karnaphuli Gas Distribution Company Limited |
| KM | = Kilo Meter |
| KTOE | = Kilotonne of Oil Equivalent |
| KUET | = Khulna University of Engineering and Technology |
| Kw/KW | = Kilowatt |
| Kwh | = Kilowatt hour |
| LCV | = Lower Calorific Value |
| LGED | = Local Government Engineering Department |
| LHV | = Lower Heating Value |
| LPE | = Livestock and Poultry Expert |
| LPG | = Liquefied Propane Gas |
| m ³ | = Cubic Meter |
| MC | = Middle Canopy |
| MJ | = Mega Joule |

| | |
|----------------------|--|
| MNRE | = The Ministry of New and Renewable Energy |
| MoA | = Ministry of Agriculture |
| MoEFCC | = Ministry of Environment, Forest and Climate Change |
| MoFL | = Ministry of Fisheries and Livestock |
| MoP | = Ministry of Planning |
| MoPEMR | = Ministry of Power, Energy and Mineral Resources |
| MSW | = Municipal Solid Waste |
| MSWE | = Municipal Solid Waste Expert |
| MTOE | = Megaton of oil equivalent |
| MW | = Mega Watt |
| MW _e | = Mega Watt Electric |
| M.Ton | = Metric Ton (1000 KG) |
| M _{HA} | = Production of Hybrid Aus |
| M _{HB} | = Production of Hybrid Boro |
| M _{LA} | = Production of Local Aus |
| M _{LB} | = Production of Local Boro |
| M _{MZ} | = Production of Maize |
| M _W | = Production of Wheat |
| M _{PL} | = Production of Pulses |
| M _{OL} | = Production of Oil Seeds |
| M _{SC} | = Production of Sugarcane |
| M _{PT} | = Production of Potato |
| M _{BA} | = Production of Banana |
| M _{JU} | = Production of Jute |
| NACOM | = Nature Conservation Management |
| NAPA | = National Adaptation Programme of Action |
| NEP | = National Energy Policy |
| NFA | = National Forest Assessment |
| NFI | = National Forest Inventory |
| NT | = Numbers of Truck used to dispose MSW per day |
| NG | = Natural Gas |
| NGL | = Natural Gas Liquids |
| NGO | = Non-government Organizations |
| N _{buffalo} | = Number of Buffalo |
| N _{cow} | = Number of Cow |
| N _{goat} | = Number of Goat |
| O ₂ | = Oxygen |
| PAB | = Practical Action Bangladesh |
| PC | = Project Coordinator |
| PCFC | = Per Capita Fuel Consumption |
| PDD | = Project Design Document |
| PER | = Primary Energy Resource |
| PCFC | = Per Capita Fuel Consumption |
| PGCL | = Pashchimanchal (West Region) Gas Company Limited |
| PJ | = Peta (10 ¹⁵) Joule |
| PKSF | = Palli Karma Sahayak Foundation |

| | |
|-------------------------|--|
| PPP | = Public Private Partnership |
| PROD | = Total production in particular sector |
| PR _{LA} | = Mass of Plant Residue (straw) |
| PR _{LAR} | = Mass of Plant Residue (root) |
| PR _{RW} | = Weight of plant Root |
| PR _W | = Weight of Plant Residue |
| P _{opD1} | = Population of the District |
| PSTP | = Pagla Sewerage Treatment Plant |
| pV/PV | = Photovoltaic |
| QTY | = Amount of waste in Ton per truck |
| RE | = Renewable Energy |
| REB | = Rural Electrification Board |
| PRIM | = Rubber Research Institute of Malaysia |
| RIMS | = Resource Information Management System |
| RRDD+ | = Reducing Emissions from Deforestation and Forest Degradation Plus |
| RSF | = Rural Services Foundation |
| SDG | = Sustainable Development Goals |
| SDS | = Sustainable Development Scenario |
| SHS | = Solar Home System |
| SGCL | = Sundarban Gas Company Limited |
| SID | = Statistics and Informatics Division, Government of Bangladesh |
| SIDA | = Swedish International Development Authority |
| SNC | = Second National Communication |
| SNFA | = Second National Forest Assessment |
| SNV | = The Netherlands Development Organization |
| SREDA | = Sustainable and Renewable Energy Development Authority |
| SREPGen | = Development of Sustainable Renewable Energy Power Generation |
| SS | = Sewage Sludge |
| SUST | = Shahjalal University of Science and Technology |
| SWDS | = Solid Waste Disposal Site |
| SYB | = Statistical Year Book |
| S _n | = Other Sources of MSW |
| S _{sludge} | = Surplus Sewage Sludge |
| S ₁ | = MSW deposited in City corporation/ Municipal MSW dumpsite (ton/yr) |
| TC | = Top Canopy |
| TGTDCL | = Titas Gas Transmission and Distribution Company Ltd. |
| TJ | = Tera (10 ¹²) joules |
| TL | = Team Leader |
| TNC | = Third National Communication |
| ToR | = Terms of Reference |
| TP | = Transport Permission |
| TPES | = Total Primary Energy Supply |
| TWh | = (Tera 10 ¹² watt-hours) |
| T _{brick kiln} | = District wise Total wood-lot Biomass fuels used in Brick kiln |
| T _{BU} | = District wise Total Fire Wood Supply from Built up Area |
| T _{BU(F)} | = District wise Total Biomass Fuel Supply from Built up Area |

| | |
|--------------------|--|
| T_{CL} | = District wise total fire-wood supply from the cultivated land |
| $T_{CL(F)}$ | = District wise total Biomass Fuel supply from the cultivated land |
| $T_{firewood}$ | = Total Biomass Fuels used for Cooking |
| $T_{I(Dung)}$ | = District Wise Total Dung Supply |
| $T_{I(Supply)}$ | = District wise Total Livestock Biomass Supply |
| $T_{I(litter)}$ | = District wise Total Litter Supply |
| $T_{leaves+twigs}$ | = Total Biomass from Leaves and Twigs |
| $T_{LF(supply)}$ | = District wise Total Livestock Biomass Fuel Supply |
| $T_{IW(F)}$ | = District wise Total Industrial Waste biomass fuel supply |
| $T_{MSW(F)}$ | = Total Energy Value of MSW |
| TNC | = Third National Communication |
| $T_{SS(F)}$ | = Total District wise Sewage Sludge Biomass Fuel Supply |
| T_{VL} | = Total Fire Wood Supply from Village Level |
| $T_{VL(F)}$ | = Total Biomass Fuel Supply from Village Level |
| T_{LA} | = Total Biomass Supply from Local Aus |
| T_{HA} | = Total Biomass Supply from Hybrid Aus |
| T_{LAM} | = Total Biomass Supply from Local Aus |
| T_{LB} | = Total Biomass Supply from Local Boro |
| T_{HB} | = Total Biomass Supply from Hybrid Boro |
| T_{JU} | = Total Biomass Supply from Jute |
| T_{BA} | = Total Biomass Supply from Banana |
| T_{PT} | = Total Biomass Supply from Banana |
| T_{SC} | = Total Biomass Supply from Sugarcane |
| T_{OL} | = Total Biomass Supply from Oil Seeds |
| T_{PL} | = Total Biomass Supply from Pulses |
| T_{MZ} | = Total Biomass Supply from Maize |
| T_W | = Total Biomass Supply from Wheat |
| UK | = United Kingdom |
| UN | = The United Nations |
| UNDP | = United Nations Development Programme |
| UNFPA | = United Nations Population Fund |
| UNFCCC | = United Nations Framework Convention on Climate Change |
| USA | = The United States of America |
| USF | = Un-classed State Forest |
| V | = Volume |
| vf | = Village Forest |
| WB | = World Bank |
| VERC | = Village Education Research Center |
| VOL | = Cubic Meter of Waste Handled per Truck |
| WEEE | = Waste Electrical and Electronic Equipment |
| WGF | = Waste Generation Factor per unit production |
| WPC | = Waste generation Per Capita per year (ton/yr) |
| WRI | = World Resource Institute |
| WZPDCL | = West Zone Power Distribution Company Limited |
| W_{wet} | = Mass of Wet Dung |
| ρ | = Mass Density (Tons/m ³) |

COMPONENT-7

**Assessment of Consumption of Biomass Fuels for
Cooking and other End-uses Including Power Generation
for 64 Districts**

Component 7: Assessment of Consumption of Biomass Fuels for Cooking and other End-uses Including Power Generation for 64 Districts

7.1 Introduction

The Government of Bangladesh (GOB) is trying to reduce the annual growth rate of GHG emission especially from the fossil fuel based power generation by increasing the share of renewable energy in its energy mix. Electricity production in Bangladesh mainly depends on non-renewable fossil fuels having limited local reserves. In 2017, total installed capacity of electricity was 13,179 MW and the distribution according to fuel type was natural gas 62.01 percent, furnace oil 21.97 percent, diesel 7.83 percent, coal 1.90 percent, hydro 1.75 percent and power import 4.55 percent. The government is now focusing on the alternative sources of energy to harness electricity to meet the continuous increasing demand.

To achieve a greater share of renewable energy in its energy mix, this project is exploring the potential of biomass fuels for power generation. The Component 7 of the report is intended to provide an estimate of consumption of biomass fuels in domestic cooking and other end uses in different districts of Bangladesh. Additionally, it shows a projection of biomass fuels consumptions up to the year 2040.

7.2 Objective

The main objectives of the Component 7 are to estimate consumption of biomass fuels for rural household cooking, rice parboiling, urban household cooking, urban commercial units, rural agro processing and rural non-agro processing industries. The major activities, approaches and methodologies related to the assessment of the biomass fuels consumption are described in Table 7.1.

Table 7.1: Major Activities and their Related Approach and Methodology

| Activities | Approaches and Methodologies |
|---|---|
| 7.1 Estimate the number of households using kerosene for lighting | The methodology given in the ToR has been followed for estimating the number of households using kerosene for lighting. Secondary information has been collected on the use of kerosene for lighting in Bangladesh. Number of households using kerosene for lighting was calculated by deducting the number of households using grid connection from the total number of households. It was assumed that number of household using exclusively solar power is negligible. BPC data for kerosene consumption for the year of 2015 and BEPP values for kerosene consumption for lighting/household/month have been used. |
| 7.2 Assess the amount of kerosene used for cooking | Data from BPC and other secondary information has been collected and are used to assess the total amount of kerosene consumed in each district. Kerosene consumption for cooking has been calculated from total kerosene and kerosene used for lighting. |
| 7.3 Assess the biomass fuels consumed for cooking | Secondary data and desktop research have been utilized to get the information on household cooking using biomass. The methodology mentioned in the ToR has been modified as follows: |

| Activities | Approaches and Methodologies |
|--|---|
| | LPG consumption data for each district has been used and distributed as urban and rural based on the respective population. Total energy consumed from LPG and kerosene for cooking has been calculated. Total energy consumed for cooking calculated from BEPP data is 19.90 GJ/household/year for both rural and urban households. Household cooking energy consumed from biomass fuels was found from the difference between the total energy and the energy consumed from LPG, NG and kerosene. |
| 7.4 Assess the consumption of biomass fuels for other uses | First a list of other uses of biomass fuels has been compiled through discussion with experts. BEPP report has been consulted to identify some biomass fuels consumption sectors as well as some specific reference values (GOB, 1987). Assessment of the biomass fuels consumed in these end-uses was performed using proxy data and other indirect methods (<i>e.g.</i> from agricultural statistics, industrial data, alternative fuel consumption) as suggested in the TOR by SREDA. |
| 7.5 Assess the total consumption of biomass fuels in all end uses. | The methodology mentioned in the ToR has been followed. |
| 7.6 Assess the Future projection of biomass fuels | This has been performed in consultations with SREDA and the relevant experts. This has been linked with the analytical model for projection of biomass fuels. |
| 7.7 Report on biomass fuels consumptions for different end uses. | Having completed activities 7.1 to 7.6, this final report has been generated on the basis of the available data on biomass consumption for different end uses in Bangladesh. Finally, the report has been finalized after all components are taken care of. |

7.3 Conceptual Diagrams

A conceptual diagram and analytical equations of the Component 7, developed as a part of the Integrated Conceptual Diagram shown in Component 2 of the study, have been shown in Appendix VII.I.

A schematic diagram of the implementation plan to calculate biomass fuels consumption and thereby investigate its potential to use for electricity generation has been shown in Figure 7.1. Wide range of relevant data have been collected and analyzed for the

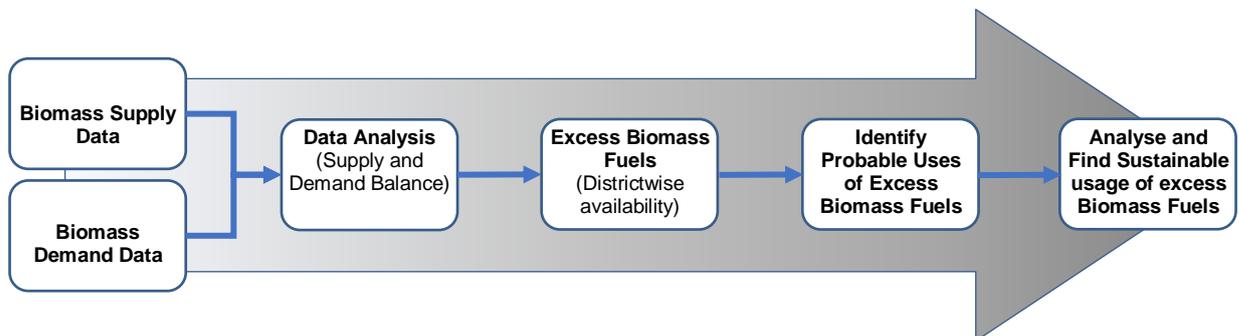


Figure 7.1: Implementation Plan on the Estimation of Biomass Fuels Consumption

assessment of biomass fuels consumption in 64 districts of Bangladesh. This has been compared with the biomass fuels supply data as estimated in previous Components of this study.

The sectors consuming significant amount of biomass fuels have been identified and shown in Figure 7.2. It may be seen from the figure that most of the biomass fuels consumption has been estimated for the major sectors such as rural household cooking, rice parboiling, urban household cooking, urban commercial units, rural agro processing and rural non-agro processing industries. Rural agro processing includes sugar and ghur production and tea processing. Brick kilns are considered as the main industry under the ‘non-agro processing industries’ category. Although lime and pottery industries use biomass fuels to some extent, the total amount of biomass consumed in this sector with respect to the total biomass consumption is quite low. Therefore, it has not been considered in this component. Urban commercial units mainly consist of tea stalls and restaurants serving in the urban areas. District-wise biomass fuels consumptions in the above mentioned consumption categories, have been estimated by using secondary data.

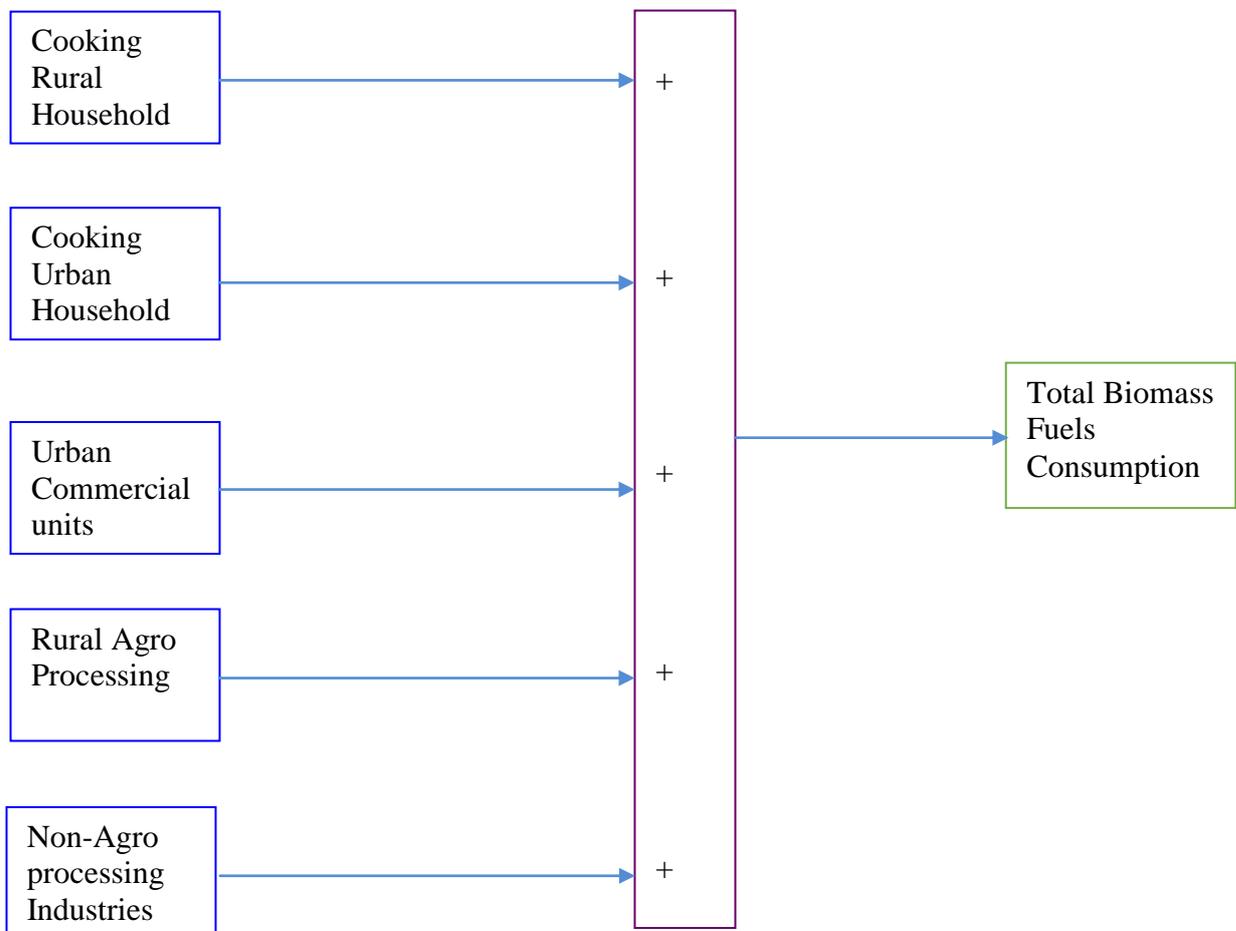


Figure 7.2: Conceptual Diagrams for Computation of Consumption of Biomass fuels

7.3.1 Biomass Fuels Consumption for Rural Household Cooking

Rural household cooking energy consumption from biomass has been calculated from secondary data following an indirect approach depicted in the conceptual diagram shown in

Figure 7.3. Since there was no population census carried out after 2011, district wise population and household data were obtained from 2011 census (GOB, 2012) and extrapolated for 2015 by using the total population in 2015 (WB, 2018). According to the World Bank calculation, 65.69% population lived in rural areas in 2015. This ratio has been used for most of the districts except for few districts as mentioned in the Table 7.3.

The ratio of urban–rural population were adjusted for Dhaka and Chattogram districts as well as for all districts of Rangpur division. It was assumed that 50% and 65% of population live in urban areas for Chattogram and Dhaka districts, respectively. Because of the recent migration pattern, 45% of population are considered as urban for the districts in Rangpur division. Since according to 2011 census, the rural and urban household distribution showed almost similar ratio as the population distribution; the same ratio has been used for household distribution.

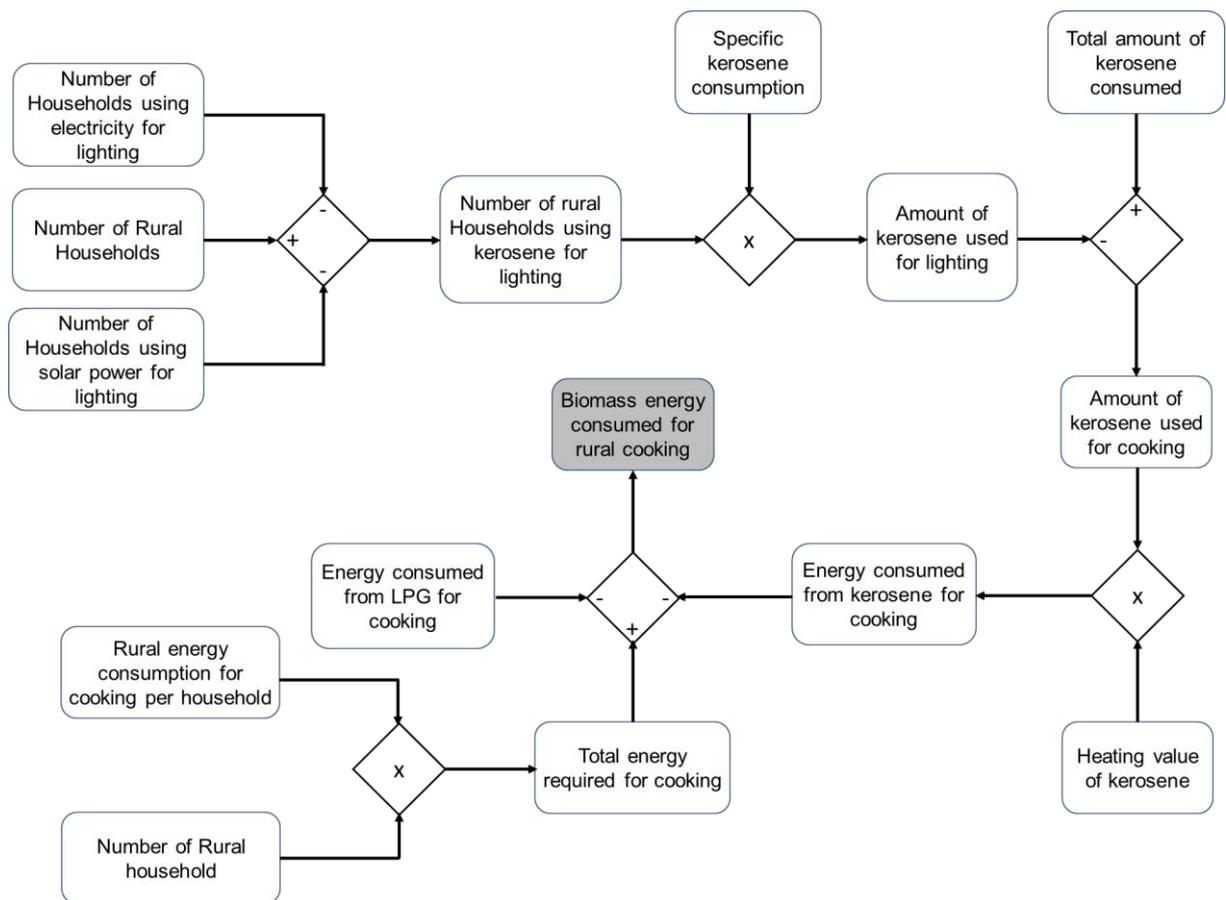


Figure 7.3: Conceptual Diagram to Compute the Biomass Fuels Consumption in Rural Household Cooking

7.3.2 Biomass Fuels Consumption in Urban Household Cooking

Urban household cooking energy consumption from biomass has also been calculated from secondary data following an indirect approach shown in Figure 7.4. Population data and distribution behavior was considered same as discussed in the previous section. Energy consumption data for urban household lighting was calculated to evaluate the kerosene consumption for lighting and cooking in the urban households.

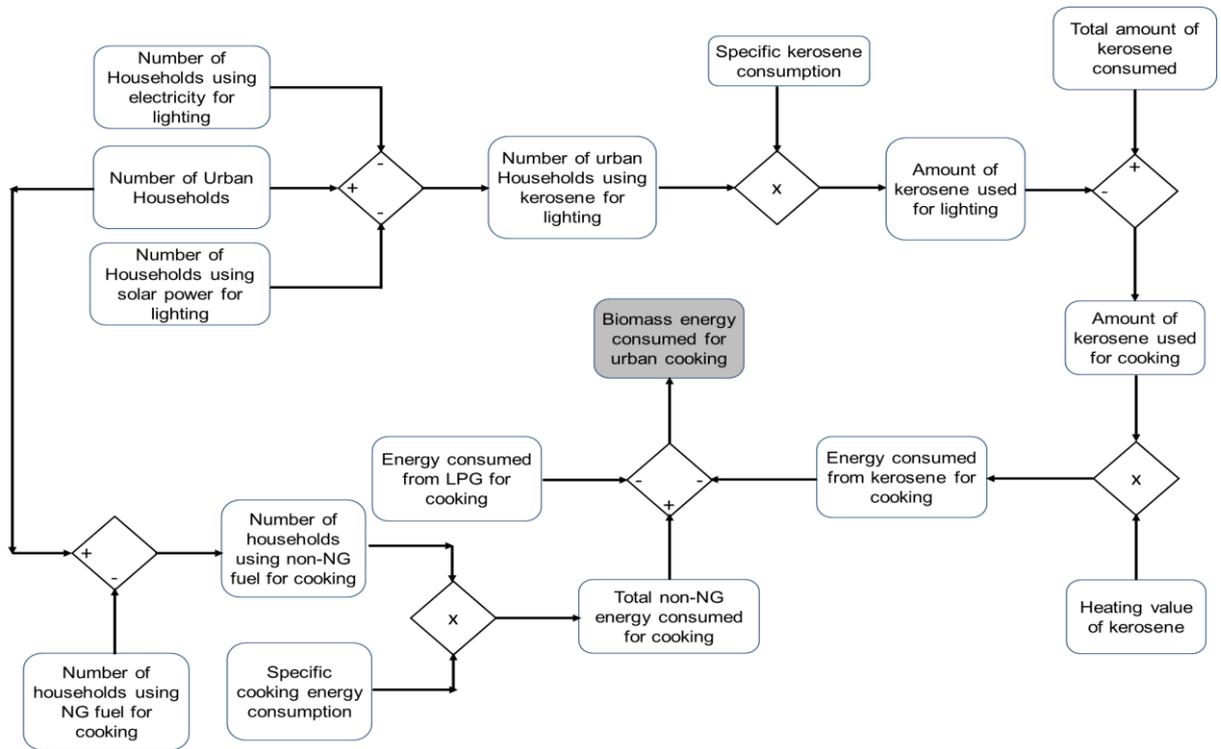


Figure 7.4: Conceptual Diagram to Compute the Biomass Fuels Consumption in Urban-Household Cooking

7.3.3 Biomass Fuels Consumption in Urban Commercial Units

A conceptual diagram showing the calculation approach for biomass fuels consumption in urban commercial units is shown in Figure 7.5.

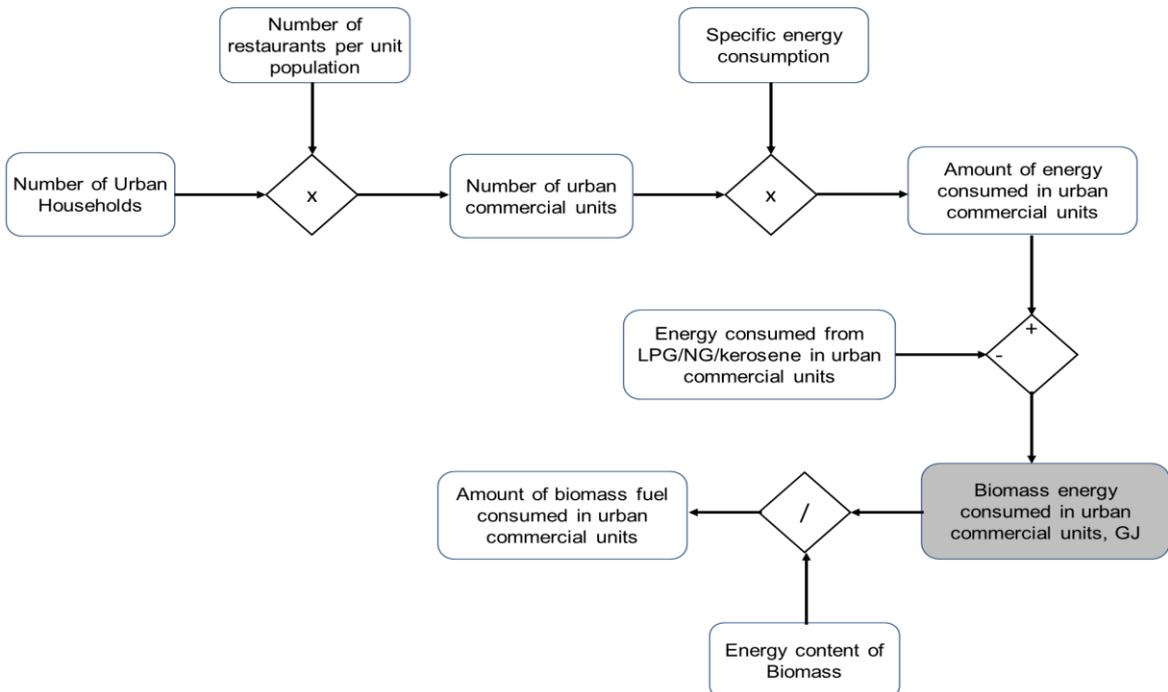


Figure 7.5: Conceptual diagram for Biomass Fuels Consumption in Urban Commercial units

7.3.4 Biomass Fuels Consumption in Rural Agro Processing

Three major agro processing industries have been considered in this study; rice parboiling, sugarcane processing and Tea processing. Biomass fuels consumption in each of these sectors were calculated in different methods and, therefore, discussed separately.

Rice Parboiling

Amount of rice produced in each district was obtained from Departmental of Agricultural Extension (DAE, 2015). A conceptual diagram showing the calculation approach for biomass fuels consumption in rice parboiling is shown in Figure 7.6.

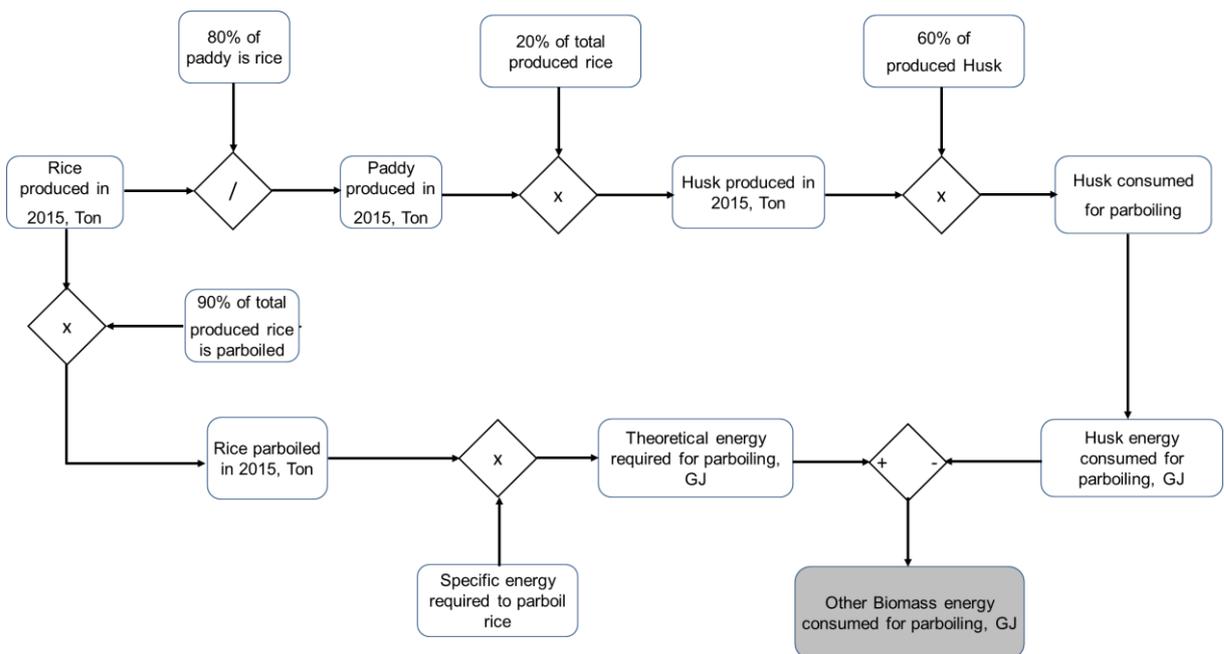


Figure 7.6: Conceptual diagram to compute the Biomass Fuels Consumption in Rice parboiling

Sugarcane Processing

District-wise sugarcane production data have been obtained from BBS Agricultural Yearbook (GOB, 2017). Sugar is produced only in few districts and the amount of sugarcane consumed in those districts was obtained from the annual report of sugar mill corporation (BSFIC, 2016). A conceptual diagram showing the calculation approach for biomass consumption in sugar cane processing industries is shown in Figure 7.7.

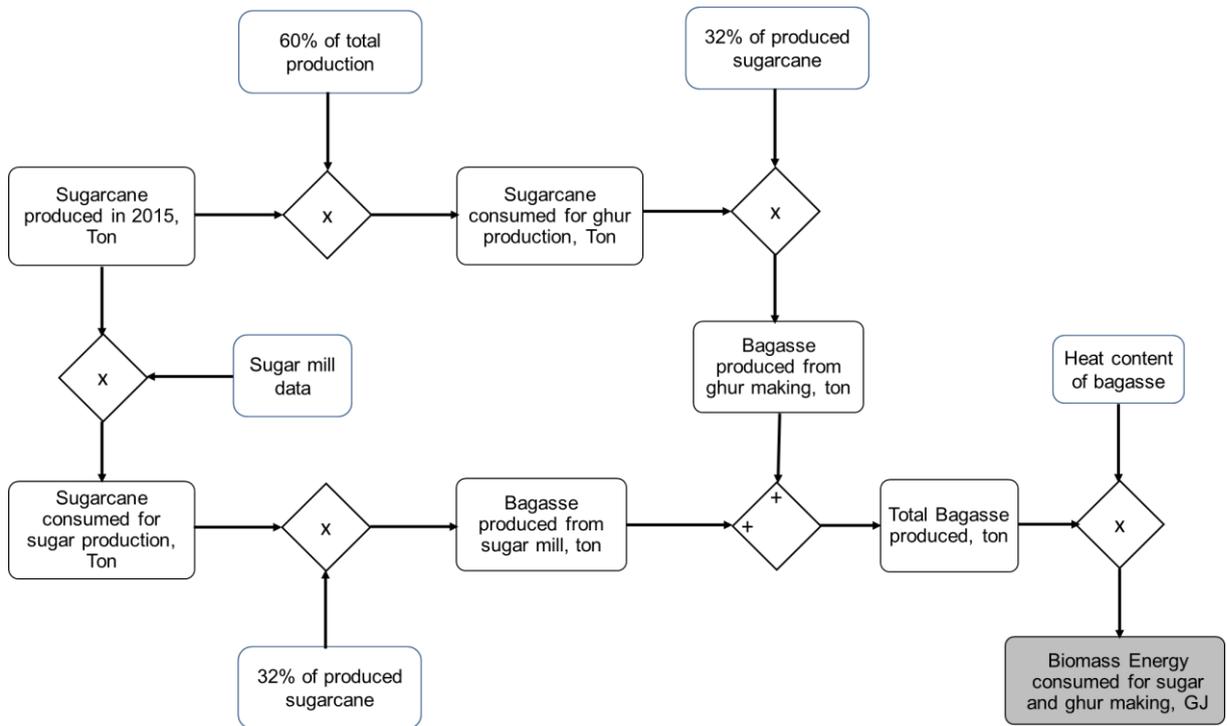


Figure 7.7: Conceptual diagram to compute the Biomass Fuels consumption in sugar cane processing

Tea Processing

District-wise tea production data have been obtained from BBS Agricultural Yearbook (GOB, 2017). It was reported that 43.2 MJ thermal energy is required to process 1 kg tea (Taulo & Sebitosi, 2015, Tiwari & Chauhan, 2016). In addition, Bangladesh tea industry consumes approximately 3,220 tons of kerosene (The Daily Star, 2013). Figure 7.8 shows the conceptual diagram describing the calculation approach for biomass consumption in rural agro-processing industries.

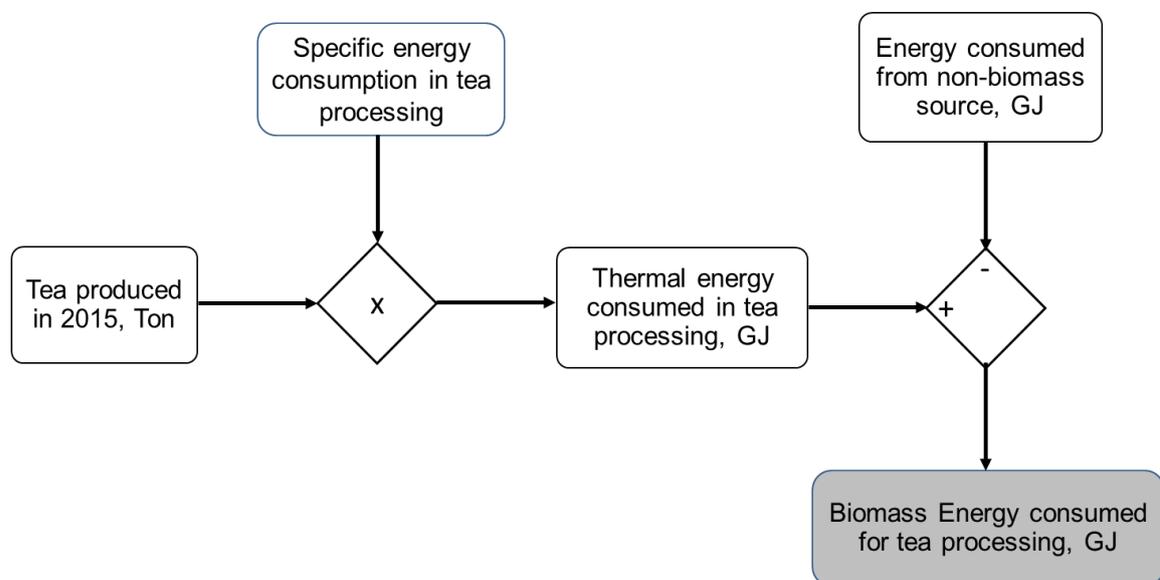


Figure 7.8: Conceptual diagram to Compute the Biomass Fuels Consumption in Tea processing

7.3.5 Biomass Fuels Consumption in Non-Agro Processing Industries

Brick kilns are considered as the main industry under the ‘Non-Agro processing industries’ category. The number of each type of brick kiln in different districts has been obtained from Department of Environment (DoE) (Choudhury & Ahmed, 2019). Considering the fact that total 23 billion bricks were produced in Bangladesh in 2015-16, this was distributed among the kilns with equal weightage. A conceptual diagram showing the calculation approach for biomass fuels consumption in brick kilns is shown in Figure 7.9.

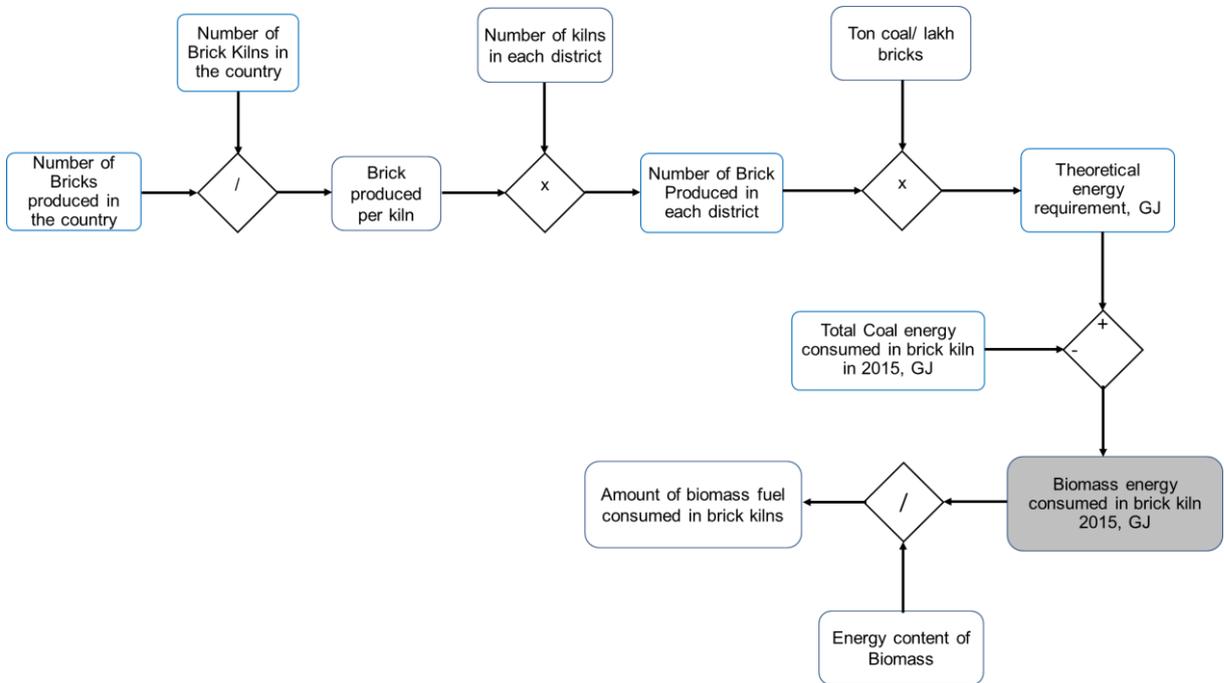


Figure 7.9: Conceptual Diagram to Compute the Biomass Fuels Consumption in Brick kiln

7.4 Organizations

At present no organization is responsible for collection, analysis and presentation of data on consumption of biomass fuels. For planning and sustainable development of biomass fuels, it would be necessary to establish permanent institutional system to perform the above responsibilities.

7.5 Data Collection and Analysis

The following organizations and their publications have been consulted for the collection of data and information: Bangladesh Bureau of Statistics (BBS), Bangladesh Energy Regulatory Commission (BERC), Bangladesh Petroleum Corporation (BPC), Bangladesh Power Development Board (BPDB), Bangladesh Rural Electrification Board (BREB), Bangladesh Sugar and Food Industries Corporation (BSFIC), Department of Environment (DOE), Infrastructure Development Company Ltd. (IDCOL), Karnafuli Gas Distribution Company Ltd. (KGDCL), Ministry of Environment, Forest and Climate Change (MoEFCC), Paschimanchal Gas Company Ltd. (PGCL), Petrobangla and Titas Gas Transmission and Distribution Company Ltd. (TGTDCCL).

For each biomass fuels consuming sector, different relevant data have been collected to calculate energy consumption. Data sources for individual sector are listed in Table 7.2.

Table 7.2: Data Requirements and Data Sources for Different End-Use Sectors Consuming Biomass Fuels

| | Sectors | Data Type | Data source |
|---|------------------------|--|--|
| | (1) | (2) | (3) |
| 1 | Rural cooking | <ul style="list-style-type: none"> Total number of rural households Number of household without non-biomass fuels Number of population without non-biomass fuels (or population/ household) Cooking fuels consumption/household (or person) | BEPP specific values for lighting energy and cooking energy per household, REB connections, BBS data |
| 2 | Urban cooking | <ul style="list-style-type: none"> Total number of urban households Number of population (or population/ household) without non-biomass fuels Connection of domestic natural gas connection LPG consumption in urban area | BEPP specific values for lighting energy and cooking energy per household, NG connection, LPG consumers |
| 3 | Paddy parboiling | <ul style="list-style-type: none"> Total amount of paddy produced Total amount of paddy parboiled Fuel requirement/ton paddy | Agricultural statistics Literature values |
| 4 | Rural agro processing | <ul style="list-style-type: none"> Total amount of sugarcane produced Total consumption of sugarcane in sugar mills Tons of Ghur production from sugarcane juice Energy usage per tonne of ghur Energy requirement to process specific mount of tea | BBS year book Data from Sugar mills corporation Literature values |
| 5 | Brick kiln | <ul style="list-style-type: none"> Number of bricks produced/year Amount of coal consumption per 100,000 bricks in different type of brick kilns | Brick Kiln owner association, DOE |
| 6 | Urban Commercial units | <ul style="list-style-type: none"> Number of restaurants for specific number of people LPG consumption in commercial units | BEPP reference of urban commercial units per specific number of people LPG suppliers Literature values |

Compiled by: Choudhury and Ahmed (2019)

7.5.1 Assumptions and Coefficients Used for Calculations

Number of population and households are available from the population and housing census 2011 for individual districts (GOB, 2012) which has been corrected for 2015. It is reported that in 2015 on an average 65.69% population lived in rural areas and 34.31% population lived in the urban areas (WB, 2018). These ratios are used to distribute the urban and rural population and households for each district. However, this ratio has been modified to 50-50 and 65-35 (urban-rural) for Chattogram and Dhaka, respectively for their more urbanized nature. In addition, some of the population from Rangpur division seem to migrate to the urban areas for various reasons and therefore, the ratio has been considered as 45-55 (urban-rural) for the districts of Rangpur division. Assumptions and coefficients used for calculations in this study are listed in Table 7.3.

Table 7.3: Assumptions and Coefficients used for Calculations with their References

| General | | |
|--------------------|--|---------------------------|
| Assumptions | | Reference |
| 1. | <ul style="list-style-type: none"> 65.69% population are rural and 34.31% population are considered as urban. Since the urban-rural ratios for both population and households were similar for census 2011, 65.69% households are assumed to be in the rural areas. | WB, 2018 GOB, 2012 |
| 2. | <ul style="list-style-type: none"> Considering more urbanised nature, the urban to rural population ratio has been modified to 50-50 and 65-35 for Chattogram and Dhaka, respectively. Some of the population in the Rangpur division seem to migrate to urban areas for various reasons. Therefore, the ratio has been considered as 45-55 (urban-rural) for the districts of Rangpur division. | Choudhury & Ahmed, 2019 |
| 3. | <ul style="list-style-type: none"> Energy content of mixed biomass is assumed to be 13.4 MJ/kg, which is the mean of the lowest (11.6) and highest (15.1) heating values reported for biomass in BEPP study (GOB, 1987) | Choudhury & Ahmed, 2019 |

| Rural and Urban Cooking | | |
|--------------------------------|---|--|
| Assumptions | | Reference |
| 1. | <ul style="list-style-type: none"> Kerosene consumption for urban lighting is 0.75 gallon/household/month (4.5 hr lighting/day) Kerosene consumption for rural lighting is 0.42 gallon/household/month (4.5 hr lighting/day) Modern lamps consume almost 50% less fuels for the same amount of lighting. Also the household size has reduced to 4.46 in urban and 4.48 in rural households. Considering these correction factors, kerosene consumption for lighting is considered as 0.3 and 0.2 gallon/household/month for urban and rural, respectively. | GOB, 1987 Choudhury & Ahmed, 2019 |
| 2. | Unless otherwise specified, districtwise kerosene consumption have been distributed in urban and rural areas based on their population ratio. | Choudhury & Ahmed, 2019 |
| 3. | <ul style="list-style-type: none"> 80% of LPG consumption in each district was assumed to be in urban areas. It is assumed that 90% of rural LPG is used for cooking. It is assumed that 90% of urban LPG is used for cooking while the rest is used in urban commercial units. | Choudhury & Ahmed, 2019 |
| 4. | <ul style="list-style-type: none"> As per BEPP norm, Kerosene consumption for urban and rural cooking is considered as 19.9 GJ/household/year [(4.44GJ/Person/year) ×(4.48 Person/household)]. | GOB, 1987 |
| 5. | <ul style="list-style-type: none"> Natural gas connection data obtained from different gas transmission companies seem relatively high compared to actual household and therefore, might include some unofficial commercial connections declared as domestic. To address this issue only 70% of the total connection were considered as purely domestic. | Choudhury & Ahmed, 2019 |

| Urban Commercial Units | | |
|-------------------------------|---|---|
| Assumptions | | Reference |
| 1. | <ul style="list-style-type: none"> It was reported that there were 275324 hotels and restaurants operating in 2009-10. This number was corrected to 291704 based on the total population in 2015. Assuming 70% of the restaurants are in urban areas, the urban commercial units in 2015 was 204193. In 2015, population was 161.2 million where 34.31% population are urban. Therefore, there was one urban commercial unit for every 271 people. 66% of the fuels consumed in the urban commercial units were biomass fuels that accounted for 12 tonnes per commercial unit every year. Therefore, the total energy consumption in each commercial unit is 270 GJ per year (18 tonnes biomass fuels with the heating value of 15 MJ/kg). | GOB, 2013b WB, 2018 GOB, 1987 |
| 2. | It was assumed that 80% of the urban commercial units use natural gas, LPG or any other non-biomass fuels. | Choudhury & Ahmed, 2019 |
| 3 | Energy content of LPG is 47.7 MJ/kg | GOB, 1987 |

| Rural Agro processing | | |
|------------------------------|--|--|
| Assumptions | | Reference |
| 1. | <ul style="list-style-type: none"> From 100 kg paddy the average yield is 70kg rice, 22.5 kg Rice husk and 7.5 kg hull. About 90% of the paddy is parboiled in Bangladesh. | GOB, 1987 Ahiduzzaman , 2007 |
| 2 | <ul style="list-style-type: none"> More than half of the produced husk (assumed 60%) is consumed for parboiling About 170 kg of rice husk is needed to parboil one tonne of paddy | GIZ, 2017 |
| 3. | Energy content of rice husk is 12.5 MJ/kg | GOB, 1987 |
| 4. | 32% (wt) of sugarcane is the bagasse. | Rahman <i>et al.</i> , 2016a |
| 5. | 60% of sugarcane produced in Bangladesh are used to make Ghur. | Rahman <i>et al.</i> , 2016b |
| 6. | Heating Value of bagasse is assumed as 11.3 MJ/kg based on the heating value range of 7.5-15.1 MJ/kg for the wet and dry samples of bagasse (GOB, 1987) | Choudhury & Ahmed, 2019 |
| 7. | <ul style="list-style-type: none"> The specific electrical and thermal energy consumption were found to be 0.64 kWh/kg and 13.41 kWh/kg of processed tea, respectively Considering older equipment, the specific thermal energy consumption is assumed as 12 kWh/kg, which is equivalent to 43.2 MJ/kg | Taulo & Sebitosi, 2015 Tiwari & Chauhan, 2016 |
| 8. | <ul style="list-style-type: none"> The Bangladesh tea industry consumes approximately 3,220 tons of kerosene/year. This was allocated to the district based on amount of tea produced. Heating value of kerosene is 46.1 MJ/kg | The Daily Star, 2013 GOB, 1987 |

| Non-Agro processing Industries | | |
|---------------------------------------|--|--------------------------------------|
| Assumptions | | Reference |
| 1. | <ul style="list-style-type: none"> The total number of bricks produced in 2016 was 23 billion pieces. Fixed Chimney Kilns (FCK) and tunnel kilns consume 22 and 20 tonnes coal/lakh bricks, respectively. Whereas, the improved zigzag kiln, zigzag kiln and Hybrid Hoffman Kilns (HHK) consume 14, 18 and 14 tonnes coal/lakh bricks, respectively. | DOE, 2017 |
| 2. | <ul style="list-style-type: none"> Each type of brick kiln has been assumed to have same production capacity. Heating value of typical coal used in brick kiln is 24.4 MJ/kg | Choudhury & Ahmed, 2019 GOB, 1987 |
| 3. | 18% brick kilns use fuel wood | The Financial Express, 2018 |

7.5.2 Biomass Fuels Consumption for Rural Household Cooking

Rural household cooking is the major biomass fuels consuming sector, where almost 90 percent is biomass fuels (GOB, 2013a).

SREDA has undertaken a Country Action Plan (CAP) for clean cookstoves to reach 100 percent households by 2030. It is reported that up to 2018 about 5.3 million ICSs (25.2 percent of rural household) have been disseminated in rural areas, out of total 21 million rural households. Impact of decrease in consumption of biomass fuels due to dissemination of 5.3 million ICS could not be ascertained due to lack of Information. District (Upazila and Union) wise data on assessment of impacts of ICS is necessary to adjust energy balance.

Divisionwise kerosene consumption for the year 2017-18 was obtained from Bangladesh Petroleum Corporation (BPC, 2018). This was calculated for 2015 using the ratio of the total amount of kerosene sold in 2015 and 2017. Kerosene was distributed among different districts based on their population. Since, no kerosene was consumed for power generation in 2015, kerosene consumption for rural cooking was calculated by deducting the kerosene consumption for lighting from total kerosene consumption. This was converted to theoretical energy consumption using the heating value 46.1 MJ/kg for kerosene.

Districtwise LPG consumption data has been obtained through personal communication from LPG distribution companies and distributed into urban and rural areas based on their populations. It was assumed that 80% of the total LPG is consumed in urban areas. It was also assumed that 90% of rural LPG consumption was for domestic cooking. Considering 47.7 MJ/kg heating value for LPG, rural cooking energy from LPG has been calculated. As per BEPP report, typical energy requirement in rural domestic cooking using biomass fuels was considered as 19.90 GJ/household/year (GOB, 1987). This value was calculated considering the different household size in 2015 compared to 1987. This was multiplied by number of biomass fuels using household to calculate the total energy requirement for rural cooking in each district. Biomass energy consumption for rural cooking was calculated by subtracting the kerosene and LPG based cooking energy from the total rural cooking energy consumption (Table 7.6; column 6). Fuel mix for the rural domestic cooking in terms of

energy consumption is shown in Table 7.4.1. Since many of the household used multiple fuel sources, it was not possible to distribute the household in terms of households using exclusively one specific fuel. However, an approximate scenario can be drawn considering constant average annual cooking energy consumption per household (19.9 GJ). This information was used to calculate the approximate number of households using each fuel. Table 7.4.2 and Table 7.4.3 summarize this in terms of number of households and percentage of total rural households, respectively. Detailed calculation methods and relevant data of this section is shown in Appendices VII.II and VII.III, respectively.

Table 7.4.1: Fuel-Mix of Rural Household Cooking in 2015

(In Terajoules)

| Serial No. of District | Division/ District | Number of Rural Households | Fuel mix (TJ) | | | | |
|----------------------------|--------------------|----------------------------|---------------------------------------|---------------------------------|----------------------------------|--|---|
| | | | Energy used for Cooking from Kerosene | Energy used for Cooking from NG | Energy used for Cooking from LPG | Energy used for Cooking from Electricity | Energy used for Cooking from Biomass Fuel |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Barishal Division | | 1369456 | 335 | 0 | 336 | 0 | 26581 |
| 1 | Barguna | 158675 | 34 | 0 | 32 | 0 | 3092 |
| 2 | Barishal | 377624 | 108 | 0 | 134 | 0 | 7273 |
| 3 | Bhola | 274005 | 50 | 0 | 29 | 0 | 5374 |
| 4 | Jhalakathi | 116255 | 25 | 0 | 39 | 0 | 2250 |
| 5 | Patuakhali | 254699 | 66 | 0 | 73 | 0 | 4929 |
| 6 | Pirojpur | 188198 | 52 | 0 | 29 | 0 | 3664 |
| Chattogram Division | | 3867144 | 1707 | 0 | 968 | 0 | 74281 |
| 7 | Bandarban | 58887 | 9 | 0 | 21 | 0 | 1142 |
| 8 | Brahmanbaria | 396196 | 199 | 0 | 134 | 0 | 7551 |
| 9 | Chandpur | 372366 | 175 | 0 | 80 | 0 | 7156 |
| 10 | Chattogram | 857247 | 388 | 0 | 146 | 0 | 16525 |
| 11 | Cumilla | 774527 | 393 | 0 | 321 | 0 | 14699 |
| 12 | Cox's Bazar | 305786 | 120 | 0 | 36 | 0 | 5929 |
| 13 | Feni | 204124 | 84 | 0 | 42 | 0 | 3936 |
| 14 | Khagrachhari | 98356 | 13 | 0 | 30 | 0 | 1915 |
| 15 | Lakshmipur | 268577 | 105 | 0 | 42 | 0 | 5197 |
| 16 | Noakhali | 436615 | 209 | 0 | 84 | 0 | 8396 |
| 17 | Rangamati | 94463 | 13 | 0 | 32 | 0 | 1835 |
| Dhaka Division | | 7018897 | 1662 | 0 | 1597 | 0 | 136417 |
| 18 | Dhaka | 1091297 | 313 | 0 | 380 | 0 | 21024 |
| 19 | Faridpur | 308888 | 90 | 0 | 84 | 0 | 5973 |
| 20 | Gazipur | 607566 | 110 | 0 | 123 | 0 | 11858 |
| 21 | Gopalganj | 183692 | 59 | 0 | 50 | 0 | 3546 |
| 22 | Jamalpur | 414156 | 56 | 0 | 20 | 0 | 8166 |

| Serial No. of District | Division/ District | Number of Rural Households | Fuel mix (TJ) | | | | |
|--------------------------|--------------------|----------------------------|---------------------------------------|---------------------------------|----------------------------------|--|---|
| | | | Energy used for Cooking from Kerosene | Energy used for Cooking from NG | Energy used for Cooking from LPG | Energy used for Cooking from Electricity | Energy used for Cooking from Biomass Fuel |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 23 | Kishoreganj | 461172 | 76 | 0 | 93 | 0 | 9008 |
| 24 | Madaripur | 185366 | 64 | 0 | 81 | 0 | 3545 |
| 25 | Manikganj | 238770 | 74 | 0 | 105 | 0 | 4572 |
| 26 | Munshiganj | 230290 | 79 | 0 | 116 | 0 | 4388 |
| 27 | Mymensingh | 849412 | 174 | 0 | 86 | 0 | 16643 |
| 28 | Narayanganj | 496702 | 163 | 0 | 147 | 0 | 9574 |
| 29 | Narsingdi | 351381 | 114 | 0 | 107 | 0 | 6772 |
| 30 | Netrokona | 352241 | 67 | 0 | 21 | 0 | 6922 |
| 31 | Rajbari | 175077 | 48 | 0 | 59 | 0 | 3377 |
| 32 | Shariatpur | 182227 | 63 | 0 | 35 | 0 | 3528 |
| 33 | Sherpur | 251010 | 29 | 0 | 16 | 0 | 4951 |
| 34 | Tangail | 639650 | 83 | 0 | 74 | 0 | 12572 |
| Khulna Division | | 2749276 | 482 | 0 | 569 | 0 | 53660 |
| 35 | Bagerhat | 260405 | 45 | 0 | 55 | 0 | 5082 |
| 36 | Chuadanga | 203976 | 44 | 0 | 49 | 0 | 3966 |
| 37 | Jashore | 482558 | 102 | 0 | 51 | 0 | 9449 |
| 38 | Jhenaidah | 310475 | 58 | 0 | 64 | 0 | 6056 |
| 39 | Khulna | 402379 | 27 | 0 | 169 | 0 | 7812 |
| 40 | Kushtia | 350876 | 74 | 0 | 36 | 0 | 6872 |
| 41 | Magura | 151368 | 31 | 0 | 37 | 0 | 2945 |
| 42 | Meherpur | 122263 | 24 | 0 | 18 | 0 | 2391 |
| 43 | Narail | 119540 | 26 | 0 | 19 | 0 | 2333 |
| 44 | Satkhira | 345437 | 51 | 0 | 70 | 0 | 6753 |
| Rajshahi Division | | 3298465 | 809 | 0 | 321 | 0 | 64510 |
| 45 | Bogura | 637471 | 112 | 0 | 34 | 0 | 12540 |
| 46 | Joypurhat | 178314 | 47 | 0 | 34 | 0 | 3468 |
| 47 | Naogaon | 482108 | 107 | 0 | 30 | 0 | 9457 |
| 48 | Natore | 311609 | 69 | 0 | 34 | 0 | 6098 |
| 49 | Chapainawabganj | 263168 | 68 | 0 | 50 | 0 | 5118 |
| 50 | Pabna | 434286 | 136 | 0 | 48 | 0 | 8458 |
| 51 | Rajshahi | 465903 | 129 | 0 | 77 | 0 | 9065 |
| 52 | Sirajganj | 525607 | 140 | 0 | 14 | 0 | 10305 |
| Rangpur Division | | 2349814 | 110 | 0 | 265 | 0 | 46387 |
| 53 | Dinajpur | 440566 | 57 | 0 | 74 | 0 | 8636 |

| Serial No. of District | Division/ District | Number of Rural Households | Fuel mix (TJ) | | | | |
|------------------------|--------------------|----------------------------|---------------------------------------|---------------------------------|----------------------------------|--|---|
| | | | Energy used for Cooking from Kerosene | Energy used for Cooking from NG | Energy used for Cooking from LPG | Energy used for Cooking from Electricity | Energy used for Cooking from Biomass Fuel |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 54 | Gaibandha | 376867 | 13 | 0 | 13 | 0 | 7474 |
| 55 | Kurigram | 312707 | 3 | 0 | 21 | 0 | 6199 |
| 56 | Lalmonirhat | 178771 | 1 | 0 | 20 | 0 | 3536 |
| 57 | Nilphamari | 259482 | 3 | 0 | 59 | 0 | 5101 |
| 58 | Panchagarh | 140694 | 7 | 0 | 11 | 0 | 2782 |
| 59 | Rangpur | 443279 | 14 | 0 | 54 | 0 | 8753 |
| 60 | Thakurgaon | 197447 | 10 | 0 | 14 | 0 | 3905 |
| Sylhet Division | | 1316564 | 200 | 0 | 140 | 0 | 25860 |
| 61 | Habiganj | 289134 | 51 | 0 | 29 | 0 | 5673 |
| 62 | Moulvibazar | 265517 | 46 | 0 | 37 | 0 | 5201 |
| 63 | Sunamganj | 323707 | 19 | 0 | 25 | 0 | 6397 |
| 64 | Sylhet | 438205 | 84 | 0 | 49 | 0 | 8588 |
| Bangladesh | | 21969617 | 5305 | 0 | 4195 | 0 | 427696 |

Compiled by: Choudhury and Ahmed

Table 7.4.2: Fuel mix for Rural Household Cooking in 2015 in Terms of Households

| Serial No. of District | Division/ District | Number of Rural Households | Rural Household Fuel mix (Number of Household) | | | | |
|----------------------------|--------------------|----------------------------|--|--------------------------------|---------------------------------|---|---|
| | | | Household using kerosene for cooking | Household using NG for cooking | Household using LPG for cooking | Household using electricity for cooking | Household using biomass fuels for cooking |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Barishal Division | | 1369456 | 16842 | 0 | 16889 | 0 | 1335725 |
| 1 | Barguna | 158675 | 1698 | 0 | 1584 | 0 | 155392 |
| 2 | Barishal | 377624 | 5443 | 0 | 6726 | 0 | 365455 |
| 3 | Bhola | 274005 | 2498 | 0 | 1481 | 0 | 270027 |
| 4 | Jhalakathi | 116255 | 1278 | 0 | 1936 | 0 | 113041 |
| 5 | Patuakhali | 254699 | 3307 | 0 | 3681 | 0 | 247712 |
| 6 | Pirojpur | 188198 | 2618 | 0 | 1481 | 0 | 184099 |
| Chattogram Division | | 3867144 | 85795 | 0 | 48622 | 0 | 3732728 |
| 7 | Bandarban | 58887 | 457 | 0 | 1056 | 0 | 57373 |
| 8 | Brahmanbaria | 396196 | 10005 | 0 | 6741 | 0 | 379450 |
| 9 | Chandpur | 372366 | 8783 | 0 | 3997 | 0 | 359585 |
| 10 | Chattogram | 857247 | 19505 | 0 | 7342 | 0 | 830400 |

| Serial No. of District | Division/ District | Number of Rural Households | Rural Household Fuel mix (Number of Household) | | | | |
|------------------------|--------------------|----------------------------|--|--------------------------------|---------------------------------|---|---|
| | | | Household using kerosene for cooking | Household using NG for cooking | Household using LPG for cooking | Household using electricity for cooking | Household using biomass fuels for cooking |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 11 | Cumilla | 774527 | 19761 | 0 | 16107 | 0 | 738659 |
| 12 | Cox's Bazar | 305786 | 6023 | 0 | 1812 | 0 | 297951 |
| 13 | Feni | 204124 | 4207 | 0 | 2112 | 0 | 197805 |
| 14 | Khagrachhari | 98356 | 633 | 0 | 1512 | 0 | 96211 |
| 15 | Lakshmipur | 268577 | 5297 | 0 | 2112 | 0 | 261167 |
| 16 | Noakhali | 436615 | 10491 | 0 | 4209 | 0 | 421915 |
| 17 | Rangamati | 94463 | 632 | 0 | 1621 | 0 | 92210 |
| Dhaka Division | | 7018897 | 83529 | 0 | 80230 | 0 | 6855138 |
| 18 | Dhaka | 1091297 | 15707 | 0 | 19115 | 0 | 1056475 |
| 19 | Faridpur | 308888 | 4540 | 0 | 4209 | 0 | 300139 |
| 20 | Gazipur | 607566 | 5512 | 0 | 6197 | 0 | 595856 |
| 21 | Gopalganj | 183692 | 2953 | 0 | 2537 | 0 | 178202 |
| 22 | Jamalpur | 414156 | 2823 | 0 | 984 | 0 | 410350 |
| 23 | Kishoreganj | 461172 | 3815 | 0 | 4680 | 0 | 452676 |
| 24 | Madaripur | 185366 | 3195 | 0 | 4049 | 0 | 178122 |
| 25 | Manikganj | 238770 | 3740 | 0 | 5281 | 0 | 229750 |
| 26 | Munshiganj | 230290 | 3974 | 0 | 5809 | 0 | 220507 |
| 27 | Mymensingh | 849412 | 8753 | 0 | 4328 | 0 | 836330 |
| 28 | Narayanganj | 496702 | 8207 | 0 | 7409 | 0 | 481086 |
| 29 | Narsingdi | 351381 | 5738 | 0 | 5354 | 0 | 340290 |
| 30 | Netrokona | 352241 | 3350 | 0 | 1056 | 0 | 347835 |
| 31 | Rajbari | 175077 | 2429 | 0 | 2956 | 0 | 169692 |
| 32 | Shariatpur | 182227 | 3178 | 0 | 1776 | 0 | 177274 |
| 33 | Sherpur | 251010 | 1440 | 0 | 792 | 0 | 248778 |
| 34 | Tangail | 639650 | 4178 | 0 | 3697 | 0 | 631775 |
| Khulna Division | | 2749276 | 24230 | 0 | 28575 | 0 | 2696472 |
| 35 | Bagerhat | 260405 | 2257 | 0 | 2780 | 0 | 255367 |
| 36 | Chuadanga | 203976 | 2211 | 0 | 2464 | 0 | 199301 |
| 37 | Jashore | 482558 | 5149 | 0 | 2568 | 0 | 474841 |
| 38 | Jhenaidah | 310475 | 2897 | 0 | 3241 | 0 | 304336 |
| 39 | Khulna | 402379 | 1338 | 0 | 8486 | 0 | 392555 |
| 40 | Kushtia | 350876 | 3738 | 0 | 1833 | 0 | 345306 |
| 41 | Magura | 151368 | 1547 | 0 | 1848 | 0 | 147973 |
| 42 | Meherpur | 122263 | 1218 | 0 | 880 | 0 | 120165 |
| 43 | Narail | 119540 | 1311 | 0 | 968 | 0 | 117260 |

| Serial No. of District | Division/ District | Number of Rural Households | Rural Household Fuel mix (Number of Household) | | | | |
|--------------------------|--------------------|----------------------------|--|--------------------------------|---------------------------------|---|---|
| | | | Household using kerosene for cooking | Household using NG for cooking | Household using LPG for cooking | Household using electricity for cooking | Household using biomass fuels for cooking |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 44 | Satkhira | 345437 | 2564 | 0 | 3505 | 0 | 339367 |
| Rajshahi Division | | 3298465 | 40643 | 0 | 16118 | 0 | 3241705 |
| 45 | Bogura | 637471 | 5632 | 0 | 1688 | 0 | 630151 |
| 46 | Joypurhat | 178314 | 2374 | 0 | 1688 | 0 | 174251 |
| 47 | Naogaon | 482108 | 5369 | 0 | 1512 | 0 | 475228 |
| 48 | Natore | 311609 | 3490 | 0 | 1688 | 0 | 306431 |
| 49 | Chapainawabganj | 263168 | 3425 | 0 | 2537 | 0 | 257207 |
| 50 | Pabna | 434286 | 6812 | 0 | 2428 | 0 | 425046 |
| 51 | Rajshahi | 465903 | 6482 | 0 | 3888 | 0 | 455533 |
| 52 | Sirajganj | 525607 | 7060 | 0 | 689 | 0 | 517858 |
| Rangpur Division | | 2349814 | 5506 | 0 | 13306 | 0 | 2331002 |
| 53 | Dinajpur | 440566 | 2888 | 0 | 3697 | 0 | 433981 |
| 54 | Gaibandha | 376867 | 647 | 0 | 632 | 0 | 375588 |
| 55 | Kurigram | 312707 | 134 | 0 | 1056 | 0 | 311517 |
| 56 | Lalmonirhat | 178771 | 63 | 0 | 1004 | 0 | 177704 |
| 57 | Nilphamari | 259482 | 171 | 0 | 2956 | 0 | 256354 |
| 58 | Panchagarh | 140694 | 362 | 0 | 528 | 0 | 139804 |
| 59 | Rangpur | 443279 | 721 | 0 | 2729 | 0 | 439829 |
| 60 | Thakurgaon | 197447 | 519 | 0 | 704 | 0 | 196224 |
| Sylhet Division | | 1316564 | 10043 | 0 | 7047 | 0 | 1299474 |
| 61 | Habiganj | 289134 | 2555 | 0 | 1481 | 0 | 285097 |
| 62 | Moulvibazar | 265517 | 2295 | 0 | 1848 | 0 | 261374 |
| 63 | Sunamganj | 323707 | 973 | 0 | 1268 | 0 | 321466 |
| 64 | Sylhet | 438205 | 4220 | 0 | 2449 | 0 | 431536 |
| Bangladesh | | 21969617 | 266588 | 0 | 210786 | 0 | 21492243 |

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Table 7.4.3: Fuel mix for Rural Household Cooking in 2015 in Terms of Percentage of Total Rural Households

| Serial No. of District | Division/ District | Number of Rural Households | Rural Household Fuel mix (% of Household) | | | | |
|----------------------------|--------------------|----------------------------|---|--------------------------------|---------------------------------|---|---|
| | | | Household using kerosene for cooking | Household using NG for cooking | Household using LPG for cooking | Household using electricity for cooking | Household using biomass fuels for cooking |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Barishal Division | | 1369456 | 1.23 | 0.00 | 1.23 | 0.00 | 97.54 |
| 1 | Barguna | 158675 | 1.07 | 0.00 | 1.00 | 0.00 | 97.93 |
| 2 | Barishal | 377624 | 1.44 | 0.00 | 1.78 | 0.00 | 96.78 |
| 3 | Bhola | 274005 | 0.91 | 0.00 | 0.54 | 0.00 | 98.55 |
| 4 | Jhalakathi | 116255 | 1.10 | 0.00 | 1.67 | 0.00 | 97.24 |
| 5 | Patuakhali | 254699 | 1.30 | 0.00 | 1.45 | 0.00 | 97.26 |
| 6 | Pirojpur | 188198 | 1.39 | 0.00 | 0.79 | 0.00 | 97.82 |
| Chattogram Division | | 3867144 | 2.22 | 0.00 | 1.26 | 0.00 | 96.52 |
| 7 | Bandarban | 58887 | 0.78 | 0.00 | 1.79 | 0.00 | 97.43 |
| 8 | Brahmanbaria | 396196 | 2.53 | 0.00 | 1.70 | 0.00 | 95.77 |
| 9 | Chandpur | 372366 | 2.36 | 0.00 | 1.07 | 0.00 | 96.57 |
| 10 | Chattogram | 857247 | 2.28 | 0.00 | 0.86 | 0.00 | 96.87 |
| 11 | Cumilla | 774527 | 2.55 | 0.00 | 2.08 | 0.00 | 95.37 |
| 12 | Cox's Bazar | 305786 | 1.97 | 0.00 | 0.59 | 0.00 | 97.44 |
| 13 | Feni | 204124 | 2.06 | 0.00 | 1.03 | 0.00 | 96.90 |
| 14 | Khagrachhari | 98356 | 0.64 | 0.00 | 1.54 | 0.00 | 97.82 |
| 15 | Lakshmipur | 268577 | 1.97 | 0.00 | 0.79 | 0.00 | 97.24 |
| 16 | Noakhali | 436615 | 2.40 | 0.00 | 0.96 | 0.00 | 96.63 |
| 17 | Rangamati | 94463 | 0.67 | 0.00 | 1.72 | 0.00 | 97.62 |
| Dhaka Division | | 7018897 | 1.19 | 0.00 | 1.14 | 0.00 | 97.67 |
| 18 | Dhaka | 1091297 | 1.44 | 0.00 | 1.75 | 0.00 | 96.81 |
| 19 | Faridpur | 308888 | 1.47 | 0.00 | 1.36 | 0.00 | 97.17 |
| 20 | Gazipur | 607566 | 0.91 | 0.00 | 1.02 | 0.00 | 98.07 |
| 21 | Gopalganj | 183692 | 1.61 | 0.00 | 1.38 | 0.00 | 97.01 |
| 22 | Jamalpur | 414156 | 0.68 | 0.00 | 0.24 | 0.00 | 99.08 |
| 23 | Kishoreganj | 461172 | 0.83 | 0.00 | 1.01 | 0.00 | 98.16 |
| 24 | Madaripur | 185366 | 1.72 | 0.00 | 2.18 | 0.00 | 96.09 |
| 25 | Manikganj | 238770 | 1.57 | 0.00 | 2.21 | 0.00 | 96.22 |
| 26 | Munshiganj | 230290 | 1.73 | 0.00 | 2.52 | 0.00 | 95.75 |
| 27 | Mymensingh | 849412 | 1.03 | 0.00 | 0.51 | 0.00 | 98.46 |
| 28 | Narayanganj | 496702 | 1.65 | 0.00 | 1.49 | 0.00 | 96.86 |
| 29 | Narsingdi | 351381 | 1.63 | 0.00 | 1.52 | 0.00 | 96.84 |

| Serial No. of District | Division/ District | Number of Rural Households | Rural Household Fuel mix (% of Household) | | | | |
|--------------------------|--------------------|----------------------------|---|--------------------------------|---------------------------------|---|---|
| | | | Household using kerosene for cooking | Household using NG for cooking | Household using LPG for cooking | Household using electricity for cooking | Household using biomass fuels for cooking |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 30 | Netrokona | 352241 | 0.95 | 0.00 | 0.30 | 0.00 | 98.75 |
| 31 | Rajbari | 175077 | 1.39 | 0.00 | 1.69 | 0.00 | 96.92 |
| 32 | Shariatpur | 182227 | 1.74 | 0.00 | 0.97 | 0.00 | 97.28 |
| 33 | Sherpur | 251010 | 0.57 | 0.00 | 0.32 | 0.00 | 99.11 |
| 34 | Tangail | 639650 | 0.65 | 0.00 | 0.58 | 0.00 | 98.77 |
| Khulna Division | | 2749276 | 0.88 | 0.00 | 1.04 | 0.00 | 98.08 |
| 35 | Bagerhat | 260405 | 0.87 | 0.00 | 1.07 | 0.00 | 98.07 |
| 36 | Chuadanga | 203976 | 1.08 | 0.00 | 1.21 | 0.00 | 97.71 |
| 37 | Jashore | 482558 | 1.07 | 0.00 | 0.53 | 0.00 | 98.40 |
| 38 | Jhenaidah | 310475 | 0.93 | 0.00 | 1.04 | 0.00 | 98.02 |
| 39 | Khulna | 402379 | 0.33 | 0.00 | 2.11 | 0.00 | 97.56 |
| 40 | Kushtia | 350876 | 1.07 | 0.00 | 0.52 | 0.00 | 98.41 |
| 41 | Magura | 151368 | 1.02 | 0.00 | 1.22 | 0.00 | 97.76 |
| 42 | Meherpur | 122263 | 1.00 | 0.00 | 0.72 | 0.00 | 98.28 |
| 43 | Narail | 119540 | 1.10 | 0.00 | 0.81 | 0.00 | 98.09 |
| 44 | Satkhira | 345437 | 0.74 | 0.00 | 1.01 | 0.00 | 98.24 |
| Rajshahi Division | | 3298465 | 1.23 | 0.00 | 0.49 | 0.00 | 98.28 |
| 45 | Bogura | 637471 | 0.88 | 0.00 | 0.26 | 0.00 | 98.85 |
| 46 | Joypurhat | 178314 | 1.33 | 0.00 | 0.95 | 0.00 | 97.72 |
| 47 | Naogaon | 482108 | 1.11 | 0.00 | 0.31 | 0.00 | 98.57 |
| 48 | Natore | 311609 | 1.12 | 0.00 | 0.54 | 0.00 | 98.34 |
| 49 | Chapainawabganj | 263168 | 1.30 | 0.00 | 0.96 | 0.00 | 97.73 |
| 50 | Pabna | 434286 | 1.57 | 0.00 | 0.56 | 0.00 | 97.87 |
| 51 | Rajshahi | 465903 | 1.39 | 0.00 | 0.83 | 0.00 | 97.77 |
| 52 | Sirajganj | 525607 | 1.34 | 0.00 | 0.13 | 0.00 | 98.53 |
| Rangpur Division | | 2349814 | 0.23 | 0.00 | 0.57 | 0.00 | 99.20 |
| 53 | Dinajpur | 440566 | 0.66 | 0.00 | 0.84 | 0.00 | 98.51 |
| 54 | Gaibandha | 376867 | 0.17 | 0.00 | 0.17 | 0.00 | 99.66 |
| 55 | Kurigram | 312707 | 0.04 | 0.00 | 0.34 | 0.00 | 99.62 |
| 56 | Lalmonirhat | 178771 | 0.04 | 0.00 | 0.56 | 0.00 | 99.40 |
| 57 | Nilphamari | 259482 | 0.07 | 0.00 | 1.14 | 0.00 | 98.79 |
| 58 | Panchagarh | 140694 | 0.26 | 0.00 | 0.38 | 0.00 | 99.37 |
| 59 | Rangpur | 443279 | 0.16 | 0.00 | 0.62 | 0.00 | 99.22 |
| 60 | Thakurgaon | 197447 | 0.26 | 0.00 | 0.36 | 0.00 | 99.38 |

| Serial No. of District | Division/ District | Number of Rural Households | Rural Household Fuel mix (% of Household) | | | | |
|------------------------|--------------------|----------------------------|---|--------------------------------|---------------------------------|---|---|
| | | | Household using kerosene for cooking | Household using NG for cooking | Household using LPG for cooking | Household using electricity for cooking | Household using biomass fuels for cooking |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Sylhet Division | | 1316564 | 0.76 | 0.00 | 0.54 | 0.00 | 98.70 |
| 61 | Habiganj | 289134 | 0.88 | 0.00 | 0.51 | 0.00 | 98.60 |
| 62 | Moulvibazar | 265517 | 0.86 | 0.00 | 0.70 | 0.00 | 98.44 |
| 63 | Sunamganj | 323707 | 0.30 | 0.00 | 0.39 | 0.00 | 99.31 |
| 64 | Sylhet | 438205 | 0.96 | 0.00 | 0.56 | 0.00 | 98.48 |
| Bangladesh | | 21969617 | 1.21 | 0.00 | 0.96 | 0.00 | 97.83 |

Compiled by: Choudhury and Ahmed

Rural household cooking energy consumption described above required calculation of energy consumption data for rural lighting.

Energy Consumption for Rural Lighting

Energy consumption data for household lighting was calculated to evaluate the kerosene consumption for lighting and cooking in the rural households. The number of rural households using electricity connections was obtained from REB Management Information System report (REB, 2016).

It was assumed that there is a growing number of solar power users are now using both solar and grid electricity as National Grid is expanded in many off-grid areas of the country. In grid connected areas, sometimes Solar PV is used as standby power source for reliability. Households using kerosene for lighting has been estimated considering this point. It is known that in 1987 kerosene consumption for rural lighting was 0.42 gallon/household/month (4.5 hr lighting/day) (GOB, 1987). However, it was also reported that modern lamps could consume almost 50% less fuel for the same lighting (GOB, 1987). In addition, the household size reduced significantly since 1987. Therefore, for 2015 this value was assumed as 0.2 gallon/household/month for rural area and thus the total amount of kerosene consumed for rural lighting has been calculated. Fuel mix for the rural household lighting is shown in Table 7.4.4.

Table 7.4.4: Fuel mix for Rural Household Lighting in Terms of Households

| Serial No. of District | Division/ District | Number of Rural Households | Household using kerosene for lighting | Household using Solar pV for lighting | Household using Electricity for lighting |
|----------------------------|--------------------|----------------------------|---------------------------------------|---------------------------------------|--|
| 1 | 2 | 4 | 4 | 5 | 6 |
| Barishal Division | | 1369456 | 404216 | 689926 | 965240 |
| 1 | Barguna | 158675 | 49657 | 133595 | 109018 |
| 2 | Barishal | 377624 | 69350 | 151291 | 308274 |
| 3 | Bhola | 274005 | 150596 | 93893 | 123409 |
| 4 | Jhalakathi | 116255 | 39197 | 28231 | 77058 |
| 5 | Patuakhali | 254699 | 62856 | 205702 | 191844 |
| 6 | Pirojpur | 188198 | 32561 | 77214 | 155638 |
| Chattogram Division | | 3867144 | 839429 | 922678 | 3027715 |
| 7 | Bandarban | 58887 | 58887 | 28127 | 0 |
| 8 | Brahmanbaria | 396196 | 40070 | 97439 | 356126 |
| 9 | Chandpur | 372366 | 18031 | 151500 | 354335 |
| 10 | Chattogram | 857247 | 135414 | 109684 | 721833 |
| 11 | Cumilla | 774527 | 29944 | 153016 | 744583 |
| 12 | Cox's Bazar | 305786 | 152178 | 47697 | 153608 |
| 13 | Feni | 204124 | 70508 | 12528 | 133616 |
| 14 | Khagrachhari | 98356 | 98356 | 38342 | 0 |
| 15 | Lakshmipur | 268577 | 70962 | 123569 | 197615 |
| 16 | Noakhali | 436615 | 70616 | 121126 | 365999 |
| 17 | Rangamati | 94463 | 94463 | 39650 | 0 |
| Dhaka Division | | 7018897 | 2016703 | 1092605 | 5002194 |
| 18 | Dhaka | 1091297 | 140492 | 5863 | 950805 |
| 19 | Faridpur | 308888 | 50236 | 102910 | 258652 |
| 20 | Gazipur | 607566 | 239949 | 38511 | 367617 |
| 21 | Gopalganj | 183692 | 20805 | 57497 | 162887 |
| 22 | Jamalpur | 414156 | 213819 | 76609 | 200337 |
| 23 | Kishoreganj | 461172 | 258061 | 90424 | 203111 |
| 24 | Madaripur | 185366 | 5496 | 80858 | 179870 |
| 25 | Manikganj | 238770 | 11117 | 54391 | 227653 |
| 26 | Munshiganj | 230290 | 6106 | 14452 | 224184 |
| 27 | Mymensingh | 849412 | 332176 | 123925 | 517236 |
| 28 | Narayanganj | 496702 | 6442 | 1575 | 490260 |
| 29 | Narsingdi | 351381 | 31600 | 39336 | 319782 |
| 30 | Netrokona | 352241 | 172470 | 115137 | 179771 |
| 31 | Rajbari | 175077 | 31255 | 25287 | 143822 |
| 32 | Shariatpur | 182227 | 4862 | 145825 | 177366 |
| 33 | Sherpur | 251010 | 140332 | 38363 | 110678 |
| 34 | Tangail | 639650 | 351486 | 81642 | 288164 |
| Khulna Division | | 2749276 | 743622 | 358254 | 2005654 |
| 35 | Bagerhat | 260405 | 71289 | 77564 | 189116 |
| 36 | Chuadanga | 203976 | 26107 | 3452 | 177869 |
| 37 | Jashore | 482558 | 79454 | 17962 | 403104 |
| 38 | Jhenaidah | 310475 | 74487 | 16617 | 235988 |
| 39 | Khulna | 402379 | 241499 | 87450 | 160880 |
| 40 | Kushtia | 350876 | 49420 | 15821 | 301456 |
| 41 | Magura | 151368 | 36023 | 19744 | 115345 |
| 42 | Meherpur | 122263 | 19010 | 1198 | 103253 |
| 43 | Narail | 119540 | 22683 | 19861 | 96856 |
| 44 | Satkhira | 345437 | 123650 | 98585 | 221787 |
| Rajshahi Division | | 3298465 | 877152 | 258863 | 2421313 |
| 45 | Bogura | 637471 | 269678 | 67677 | 367793 |
| 46 | Joypurhat | 178314 | 21941 | 4719 | 156373 |
| 47 | Naogaon | 482108 | 143822 | 65678 | 338286 |

| Serial No. of District | Division/ District | Number of Rural Households | Household using kerosene for lighting | Household using Solar pV for lighting | Household using Electricity for lighting |
|-------------------------|--------------------|----------------------------|---------------------------------------|---------------------------------------|--|
| 1 | 2 | 4 | 4 | 5 | 6 |
| 48 | Natore | 311609 | 96381 | 22211 | 215228 |
| 49 | Chapainawabganj | 263168 | 89776 | 4210 | 173392 |
| 50 | Pabna | 434286 | 45595 | 17851 | 388691 |
| 51 | Rajshahi | 465903 | 77626 | 14813 | 388277 |
| 52 | Sirajganj | 525607 | 132334 | 61704 | 393273 |
| Rangpur Division | | 2349814 | 931868 | 266841 | 1417946 |
| 53 | Dinajpur | 440566 | 68244 | 36834 | 372322 |
| 54 | Gaibandha | 376867 | 151136 | 51112 | 225731 |
| 55 | Kurigram | 312707 | 156627 | 76233 | 156080 |
| 56 | Lalmonirhat | 178771 | 96129 | 31099 | 82642 |
| 57 | Nilphamari | 259482 | 135737 | 10585 | 123745 |
| 58 | Panchagarh | 140694 | 57261 | 25378 | 83433 |
| 59 | Rangpur | 443279 | 186713 | 21741 | 256565 |
| 60 | Thakurgaon | 197447 | 80021 | 13859 | 117427 |
| Sylhet Division | | 1316564 | 447210 | 521511 | 869354 |
| 61 | Habiganj | 289134 | 68548 | 109516 | 220586 |
| 62 | Moulvibazar | 265517 | 66080 | 112375 | 199437 |
| 63 | Sunamganj | 323707 | 201005 | 226624 | 122702 |
| 64 | Sylhet | 438205 | 111576 | 72996 | 326629 |
| Bangladesh | | 21969617 | 6260202 | 4110678 | 15709416 |

Compiled by: Choudhury and Ahmed

Note: It was assumed that there was no exclusive solar power user and therefore, difference between total households and electricity using households are the households using kerosene for lighting.

7.5.3 Energy Consumption in Urban Household Cooking

Urban household cooking energy consumption from biomass has been calculated similarly from secondary data following an indirect approach as shown in Figure 7.4.

District wise kerosene consumption data has been calculated following the same method used for rural household cooking. The total amount of kerosene consumed in urban area has been obtained using the population distribution data. It may be noted that no kerosene has been consumed for power generation. Kerosene consumption for urban cooking was calculated by deducting the kerosene consumption for lighting from the total kerosene consumption. This was converted to theoretical energy consumption using the heating value 46.1 MJ/kg of kerosene.

The number of domestic natural gas (NG) connection in urban areas have been obtained through personal communication with different gas distribution companies (Choudhury & Ahmed, 2019). However, the data seems relatively high compared to actual household and therefore, might include some unofficial commercial connections declared as domestic. To address this issue only 70% of the total connection were considered as purely domestic. This value was deducted from the total urban household to obtain the number of urban household using non-NG fuels for cooking. Typical biomass fuels requirement in urban domestic cooking was considered as 19.90 GJ/household/year as per BEPP norm (GOB, 1987). This was multiplied by number of household to calculate total non-NG energy requirement for urban cooking in each district.

It was assumed that 90% of urban LPG consumption was used for domestic cooking. Considering 47.7 MJ/kg as heating value of LPG, urban cooking energy from LPG has been calculated. In addition, It was also assumed that electric energy consumption for cooking was negligible compared to other options. Biomass fuels consumption for urban cooking was calculated by subtracting the kerosene and LPG based cooking energy from total non-NG urban domestic cooking energy consumption (Table 7.6; column 7). Detailed calculation procedure of this section along with relevant raw data sets have been included in Appendices VII.II and VII.III, respectively. Fuel mix for the urban domestic cooking is shown in Table 7.5.1. As discussed in the previous section, 19.9 GJ/household/year cooking energy requirement was considered to calculate the approximate number of households using each fuel. Tables 7.5.2 and 7.5.3 summarize this in terms of number of households and percentage of total urban households, respectively.

Table 7.5.1: Fuel-Mix for Urban Household Cooking in 2015

(In Terajoules)

| Serial No. of District | Division/ District | Number of Urban Households | Fuel mix (TJ) | | | | |
|----------------------------|--------------------|----------------------------|---------------------------------------|---------------------------------|----------------------------------|--|--|
| | | | Energy used for cooking from Kerosene | Energy used for cooking from NG | Energy used for cooking from LPG | Energy used for cooking from Electricity | Energy used for cooking from Biomass fuels |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Barishal Division | | 715269 | 192 | 42 | 1344 | 0 | 12649 |
| 1 | Barguna | 82876 | 20 | 0 | 126 | 0 | 1503 |
| 2 | Barishal | 197233 | 54 | 0 | 535 | 0 | 3336 |
| 3 | Bhola | 143113 | 42 | 42 | 118 | 0 | 2639 |
| 4 | Jhalakathi | 60720 | 16 | 0 | 154 | 0 | 1039 |
| 5 | Patuakhali | 133030 | 35 | 0 | 293 | 0 | 2319 |
| 6 | Pirojpur | 98296 | 25 | 0 | 118 | 0 | 1813 |
| Chattogram Division | | 2429321 | 1188 | 13020 | 3870 | 0 | 28108 |
| 7 | Bandarban | 30757 | 14 | 0 | 84 | 0 | 514 |
| 8 | Brahmanbaria | 206934 | 106 | 618 | 537 | 0 | 2755 |
| 9 | Chandpur | 194487 | 90 | 683 | 318 | 0 | 2666 |
| 10 | Chattogram | 857247 | 413 | 7146 | 584 | 0 | 7732 |
| 11 | Cumilla | 404537 | 201 | 2783 | 1282 | 0 | 3323 |
| 12 | Cox's Bazar | 159713 | 86 | 0 | 144 | 0 | 2948 |
| 13 | Feni | 106614 | 54 | 945 | 168 | 0 | 798 |
| 14 | Khagrachhari | 51372 | 23 | 0 | 120 | 0 | 879 |
| 15 | Lakshmipur | 140278 | 64 | 184 | 168 | 0 | 2344 |
| 16 | Noakhali | 228045 | 116 | 660 | 335 | 0 | 3317 |
| 17 | Rangamati | 49338 | 22 | 0 | 129 | 0 | 831 |
| Dhaka Division | | 5122691 | 1684 | 31967 | 6386 | 0 | 56607 |
| 18 | Dhaka | 2026695 | 660 | 23565 | 1522 | 0 | 10680 |
| 19 | Faridpur | 161333 | 55 | 0 | 335 | 0 | 2820 |
| 20 | Gazipur | 317333 | 98 | 2574 | 493 | 0 | 2723 |
| 21 | Gopalganj | 95943 | 34 | 0 | 202 | 0 | 1673 |
| 22 | Jamalpur | 216314 | 66 | 165 | 78 | 0 | 3968 |
| 23 | Kishoreganj | 240871 | 84 | 377 | 373 | 0 | 3897 |
| 24 | Madaripur | 96817 | 34 | 0 | 322 | 0 | 1571 |
| 25 | Manikganj | 124710 | 40 | 303 | 420 | 0 | 1668 |
| 26 | Munshiganj | 120281 | 42 | 286 | 462 | 0 | 1556 |
| 27 | Mymensingh | 443649 | 148 | 974 | 345 | 0 | 7201 |
| 28 | Narayanganj | 259428 | 85 | 2355 | 590 | 0 | 1742 |
| 29 | Narsingdi | 183527 | 64 | 704 | 426 | 0 | 2341 |
| 30 | Netrokona | 183976 | 65 | 114 | 84 | 0 | 3379 |
| 31 | Rajbari | 91443 | 30 | 0 | 235 | 0 | 1554 |
| 32 | Shariatpur | 95178 | 33 | 0 | 141 | 0 | 1719 |
| 33 | Sherpur | 131103 | 39 | 85 | 63 | 0 | 2408 |
| 34 | Tangail | 334090 | 104 | 465 | 294 | 0 | 5708 |

| Serial No. of District | Division/ District | Number of Urban Households | Fuel mix (TJ) | | | | |
|--------------------------|--------------------|----------------------------|---------------------------------------|---------------------------------|----------------------------------|--|--|
| | | | Energy used for cooking from Kerosene | Energy used for cooking from NG | Energy used for cooking from LPG | Energy used for cooking from Electricity | Energy used for cooking from Biomass fuels |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Khulna Division | | 1435952 | 285 | 0 | 2275 | 0 | 26016 |
| 35 | Bagerhat | 136010 | 27 | 0 | 221 | 0 | 2459 |
| 36 | Chuadanga | 106537 | 20 | 0 | 196 | 0 | 1904 |
| 37 | Jashore | 252041 | 50 | 0 | 204 | 0 | 4761 |
| 38 | Jhenaidah | 162162 | 32 | 0 | 258 | 0 | 2937 |
| 39 | Khulna | 210163 | 42 | 0 | 675 | 0 | 3465 |
| 40 | Kushtia | 183263 | 35 | 0 | 146 | 0 | 3466 |
| 41 | Magura | 79060 | 17 | 0 | 147 | 0 | 1409 |
| 42 | Meherpur | 63858 | 12 | 0 | 70 | 0 | 1189 |
| 43 | Narail | 62436 | 13 | 0 | 77 | 0 | 1152 |
| 44 | Satkhira | 180422 | 36 | 0 | 279 | 0 | 3275 |
| Rajshahi Division | | 1722794 | 384 | 1540 | 1283 | 0 | 30821 |
| 45 | Bogura | 332952 | 69 | 544 | 134 | 0 | 5788 |
| 46 | Joypurhat | 93133 | 18 | 0 | 134 | 0 | 1701 |
| 47 | Naogaon | 251806 | 53 | 0 | 120 | 0 | 4838 |
| 48 | Natore | 162754 | 35 | 0 | 134 | 0 | 3069 |
| 49 | Chapainawabganj | 137453 | 36 | 0 | 202 | 0 | 2497 |
| 50 | Pabna | 226828 | 53 | 396 | 193 | 0 | 3805 |
| 51 | Rajshahi | 243342 | 54 | 298 | 310 | 0 | 4132 |
| 52 | Sirajganj | 274525 | 66 | 302 | 55 | 0 | 4990 |
| Rangpur Division | | 1922575 | 63 | 0 | 1059 | 0 | 37137 |
| 53 | Dinajpur | 360463 | 12 | 0 | 294 | 0 | 6866 |
| 54 | Gaibandha | 308346 | 7 | 0 | 50 | 0 | 6079 |
| 55 | Kurigram | 255851 | 8 | 0 | 84 | 0 | 5000 |
| 56 | Lalmonirhat | 146268 | 6 | 0 | 80 | 0 | 2825 |
| 57 | Nilphamari | 212304 | 9 | 0 | 235 | 0 | 3981 |
| 58 | Panchagarh | 115113 | 5 | 0 | 42 | 0 | 2244 |
| 59 | Rangpur | 362683 | 10 | 0 | 217 | 0 | 6990 |
| 60 | Thakurgaon | 161548 | 7 | 0 | 56 | 0 | 3152 |
| Sylhet Division | | 687643 | 155 | 2505 | 561 | 0 | 10048 |
| 61 | Habiganj | 151015 | 32 | 310 | 118 | 0 | 2494 |
| 62 | Moulvibazar | 138680 | 30 | 432 | 147 | 0 | 2079 |
| 63 | Sunamganj | 169073 | 39 | 160 | 101 | 0 | 3038 |
| 64 | Sylhet | 228875 | 54 | 1603 | 195 | 0 | 2437 |
| Bangladesh | | 14036246 | 3951 | 49075 | 16779 | 0 | 201386 |

Compiled by: Choudhury and Ahmed

Table 7.5.2: Fuel Mix for Urban Household Cooking in 2015 in Terms of Urban Households

| Serial No. of District | Division/ District | Number of Urban Households | Urban Household Fuel mix (Number of Household) | | | | |
|----------------------------|--------------------|----------------------------|--|--------------------------------|---------------------------------|---|---|
| | | | Household using kerosene for cooking | Household using NG for cooking | Household using LPG for cooking | Household using electricity for cooking | Household using biomass fuels for cooking |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Barishal Division | | 715269 | 9636 | 2461 | 67556 | 0 | 635617 |
| 1 | Barguna | 82876 | 1009 | 0 | 6337 | 0 | 75530 |
| 2 | Barishal | 197233 | 2699 | 0 | 26902 | 0 | 167632 |
| 3 | Bhola | 143113 | 2093 | 2461 | 5923 | 0 | 132637 |
| 4 | Jhalakathi | 60720 | 782 | 0 | 7746 | 0 | 52193 |
| 5 | Patuakhali | 133030 | 1773 | 0 | 14725 | 0 | 116532 |
| 6 | Pirojpur | 98296 | 1278 | 0 | 5923 | 0 | 91095 |
| Chattogram Division | | 2429321 | 59714 | 762682 | 194487 | 0 | 1412438 |
| 7 | Bandarban | 30757 | 725 | 0 | 4225 | 0 | 25806 |
| 8 | Brahmanbaria | 206934 | 5328 | 36196 | 26964 | 0 | 138446 |
| 9 | Chandpur | 194487 | 4509 | 40016 | 15988 | 0 | 133974 |
| 10 | Chattogram | 857247 | 20758 | 418587 | 29367 | 0 | 388535 |
| 11 | Cumilla | 404537 | 10090 | 163023 | 64429 | 0 | 166996 |
| 12 | Cox's Bazar | 159713 | 4304 | 0 | 7248 | 0 | 148160 |
| 13 | Feni | 106614 | 2694 | 55384 | 8450 | 0 | 40087 |
| 14 | Khagrachhari | 51372 | 1143 | 0 | 6047 | 0 | 44181 |
| 15 | Lakshmipur | 140278 | 3226 | 10795 | 8450 | 0 | 117807 |
| 16 | Noakhali | 228045 | 5828 | 38680 | 16837 | 0 | 166700 |
| 17 | Rangamati | 49338 | 1111 | 0 | 6482 | 0 | 41745 |
| Dhaka Division | | 5122691 | 84620 | 1872569 | 320921 | 0 | 2844581 |
| 18 | Dhaka | 2026695 | 33172 | 1380401 | 76461 | 0 | 536660 |
| 19 | Faridpur | 161333 | 2783 | 0 | 16837 | 0 | 141713 |
| 20 | Gazipur | 317333 | 4945 | 150769 | 24790 | 0 | 136829 |
| 21 | Gopalganj | 95943 | 1706 | 0 | 10148 | 0 | 84088 |
| 22 | Jamalpur | 216314 | 3330 | 9651 | 3935 | 0 | 199398 |
| 23 | Kishoreganj | 240871 | 4237 | 22078 | 18722 | 0 | 195834 |
| 24 | Madaripur | 96817 | 1697 | 0 | 16195 | 0 | 78925 |
| 25 | Manikganj | 124710 | 2025 | 17753 | 21124 | 0 | 83808 |
| 26 | Munshiganj | 120281 | 2104 | 16752 | 23237 | 0 | 78189 |
| 27 | Mymensingh | 443649 | 7432 | 57064 | 17314 | 0 | 361840 |
| 28 | Narayanganj | 259428 | 4287 | 137954 | 29636 | 0 | 87551 |
| 29 | Narsingdi | 183527 | 3238 | 41262 | 21414 | 0 | 117614 |
| 30 | Netrokona | 183976 | 3245 | 6689 | 4225 | 0 | 169818 |
| 31 | Rajbari | 91443 | 1527 | 0 | 11825 | 0 | 78091 |
| 32 | Shariatpur | 95178 | 1682 | 0 | 7104 | 0 | 86392 |
| 33 | Sherpur | 131103 | 1972 | 4955 | 3169 | 0 | 121006 |
| 34 | Tangail | 334090 | 5238 | 27241 | 14787 | 0 | 286824 |
| Khulna Division | | 1435952 | 14304 | 0 | 114298 | 0 | 1307350 |

| Serial No. of District | Division/ District | Number of Urban Households | Urban Household Fuel mix (Number of Household) | | | | |
|--------------------------|--------------------|----------------------------|--|--------------------------------|---------------------------------|---|---|
| | | | Household using kerosene for cooking | Household using NG for cooking | Household using LPG for cooking | Household using electricity for cooking | Household using biomass fuels for cooking |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 35 | Bagerhat | 136010 | 1343 | 0 | 11121 | 0 | 123546 |
| 36 | Chuadanga | 106537 | 1018 | 0 | 9858 | 0 | 95661 |
| 37 | Jashore | 252041 | 2524 | 0 | 10272 | 0 | 239245 |
| 38 | Jhenaidah | 162162 | 1615 | 0 | 12964 | 0 | 147582 |
| 39 | Khulna | 210163 | 2121 | 0 | 33944 | 0 | 174098 |
| 40 | Kushtia | 183263 | 1758 | 0 | 7331 | 0 | 174174 |
| 41 | Magura | 79060 | 855 | 0 | 7393 | 0 | 70811 |
| 42 | Meherpur | 63858 | 584 | 0 | 3521 | 0 | 59753 |
| 43 | Narail | 62436 | 671 | 0 | 3873 | 0 | 57892 |
| 44 | Satkhira | 180422 | 1815 | 0 | 14021 | 0 | 164586 |
| Rajshahi Division | | 1722794 | 19307 | 90234 | 64470 | 0 | 1548783 |
| 45 | Bogura | 332952 | 3462 | 31884 | 6751 | 0 | 290854 |
| 46 | Joypurhat | 93133 | 909 | 0 | 6751 | 0 | 85473 |
| 47 | Naogaon | 251806 | 2662 | 0 | 6047 | 0 | 243096 |
| 48 | Natore | 162754 | 1762 | 0 | 6751 | 0 | 154241 |
| 49 | Chapainawabganj | 137453 | 1812 | 0 | 10148 | 0 | 125494 |
| 50 | Pabna | 226828 | 2682 | 23216 | 9713 | 0 | 191217 |
| 51 | Rajshahi | 243342 | 2702 | 17428 | 15553 | 0 | 207659 |
| 52 | Sirajganj | 274525 | 3315 | 17707 | 2754 | 0 | 250749 |
| Rangpur Division | | 1922575 | 3171 | 0 | 53225 | 0 | 1866180 |
| 53 | Dinajpur | 360463 | 628 | 0 | 14787 | 0 | 345048 |
| 54 | Gaibandha | 308346 | 339 | 0 | 2527 | 0 | 305480 |
| 55 | Kurigram | 255851 | 387 | 0 | 4225 | 0 | 251240 |
| 56 | Lalmonirhat | 146268 | 302 | 0 | 4018 | 0 | 141948 |
| 57 | Nilphamari | 212304 | 451 | 0 | 11825 | 0 | 200027 |
| 58 | Panchagarh | 115113 | 237 | 0 | 2112 | 0 | 112764 |
| 59 | Rangpur | 362683 | 491 | 0 | 10914 | 0 | 351278 |
| 60 | Thakurgaon | 161548 | 337 | 0 | 2817 | 0 | 158394 |
| Sylhet Division | | 687643 | 7770 | 146752 | 28186 | 0 | 504935 |
| 61 | Habiganj | 151015 | 1625 | 18161 | 5923 | 0 | 125306 |
| 62 | Moulvibazar | 138680 | 1493 | 25316 | 7393 | 0 | 104478 |
| 63 | Sunamganj | 169073 | 1940 | 9386 | 5074 | 0 | 152674 |
| 64 | Sylhet | 228875 | 2712 | 93890 | 9796 | 0 | 122478 |
| Bangladesh | | 14036246 | 198521 | 2874697 | 843143 | 0 | 10119884 |

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Table 7.5.3: Fuel-Mix for Urban Household Cooking in 2015 in Terms of Percentage of Urban Households

| Serial No. of District | Division/ District | Number of Urban Households | Urban Household Fuel mix (% of Household) | | | | |
|----------------------------|--------------------|----------------------------|---|--------------------------------|---------------------------------|---|---|
| | | | Household using kerosene for cooking | Household using NG for cooking | Household using LPG for cooking | Household using electricity for cooking | Household using biomass fuels for cooking |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Barishal Division | | 715269 | 1.35 | 0.34 | 9.44 | 0.00 | 88.86 |
| 1 | Barguna | 82876 | 1.22 | 0.00 | 7.65 | 0.00 | 91.14 |
| 2 | Barishal | 197233 | 1.37 | 0.00 | 13.64 | 0.00 | 84.99 |
| 3 | Bhola | 143113 | 1.46 | 1.72 | 4.14 | 0.00 | 92.68 |
| 4 | Jhalakathi | 60720 | 1.29 | 0.00 | 12.76 | 0.00 | 85.96 |
| 5 | Patuakhali | 133030 | 1.33 | 0.00 | 11.07 | 0.00 | 87.60 |
| 6 | Pirojpur | 98296 | 1.30 | 0.00 | 6.03 | 0.00 | 92.67 |
| Chattogram Division | | 2429321 | 2.46 | 31.39 | 8.01 | 0.00 | 58.14 |
| 7 | Bandarban | 30757 | 2.36 | 0.00 | 13.74 | 0.00 | 83.91 |
| 8 | Brahmanbaria | 206934 | 2.57 | 17.49 | 13.03 | 0.00 | 66.90 |
| 9 | Chandpur | 194487 | 2.32 | 20.58 | 8.22 | 0.00 | 68.89 |
| 10 | Chattogram | 857247 | 2.42 | 48.83 | 3.43 | 0.00 | 45.32 |
| 11 | Cumilla | 404537 | 2.49 | 40.30 | 15.93 | 0.00 | 41.28 |
| 12 | Cox's Bazar | 159713 | 2.69 | 0.00 | 4.54 | 0.00 | 92.77 |
| 13 | Feni | 106614 | 2.53 | 51.95 | 7.93 | 0.00 | 37.60 |
| 14 | Khagrachhari | 51372 | 2.23 | 0.00 | 11.77 | 0.00 | 86.00 |
| 15 | Lakshmipur | 140278 | 2.30 | 7.70 | 6.02 | 0.00 | 83.98 |
| 16 | Noakhali | 228045 | 2.56 | 16.96 | 7.38 | 0.00 | 73.10 |
| 17 | Rangamati | 49338 | 2.25 | 0.00 | 13.14 | 0.00 | 84.61 |
| Dhaka Division | | 5122691 | 1.65 | 36.55 | 6.26 | 0.00 | 55.53 |
| 18 | Dhaka | 2026695 | 1.64 | 68.11 | 3.77 | 0.00 | 26.48 |
| 19 | Faridpur | 161333 | 1.73 | 0.00 | 10.44 | 0.00 | 87.84 |
| 20 | Gazipur | 317333 | 1.56 | 47.51 | 7.81 | 0.00 | 43.12 |
| 21 | Gopalganj | 95943 | 1.78 | 0.00 | 10.58 | 0.00 | 87.64 |
| 22 | Jamalpur | 216314 | 1.54 | 4.46 | 1.82 | 0.00 | 92.18 |
| 23 | Kishoreganj | 240871 | 1.76 | 9.17 | 7.77 | 0.00 | 81.30 |
| 24 | Madaripur | 96817 | 1.75 | 0.00 | 16.73 | 0.00 | 81.52 |
| 25 | Manikganj | 124710 | 1.62 | 14.24 | 16.94 | 0.00 | 67.20 |
| 26 | Munshiganj | 120281 | 1.75 | 13.93 | 19.32 | 0.00 | 65.01 |
| 27 | Mymensingh | 443649 | 1.68 | 12.86 | 3.90 | 0.00 | 81.56 |
| 28 | Narayanganj | 259428 | 1.65 | 53.18 | 11.42 | 0.00 | 33.75 |
| 29 | Narsingdi | 183527 | 1.76 | 22.48 | 11.67 | 0.00 | 64.09 |
| 30 | Netrokona | 183976 | 1.76 | 3.64 | 2.30 | 0.00 | 92.30 |
| 31 | Rajbari | 91443 | 1.67 | 0.00 | 12.93 | 0.00 | 85.40 |
| 32 | Shariatpur | 95178 | 1.77 | 0.00 | 7.46 | 0.00 | 90.77 |
| 33 | Sherpur | 131103 | 1.50 | 3.78 | 2.42 | 0.00 | 92.30 |
| 34 | Tangail | 334090 | 1.57 | 8.15 | 4.43 | 0.00 | 85.85 |

| Serial No. of District | Division/ District | Number of Urban Households | Urban Household Fuel mix (% of Household) | | | | |
|--------------------------|--------------------|----------------------------|---|--------------------------------|---------------------------------|---|---|
| | | | Household using kerosene for cooking | Household using NG for cooking | Household using LPG for cooking | Household using electricity for cooking | Household using biomass fuels for cooking |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Khulna Division | | 1435952 | 1.00 | 0.00 | 7.96 | 0.00 | 91.04 |
| 35 | Bagerhat | 136010 | 0.99 | 0.00 | 8.18 | 0.00 | 90.84 |
| 36 | Chuadanga | 106537 | 0.96 | 0.00 | 9.25 | 0.00 | 89.79 |
| 37 | Jashore | 252041 | 1.00 | 0.00 | 4.08 | 0.00 | 94.92 |
| 38 | Jhenaidah | 162162 | 1.00 | 0.00 | 7.99 | 0.00 | 91.01 |
| 39 | Khulna | 210163 | 1.01 | 0.00 | 16.15 | 0.00 | 82.84 |
| 40 | Kushtia | 183263 | 0.96 | 0.00 | 4.00 | 0.00 | 95.04 |
| 41 | Magura | 79060 | 1.08 | 0.00 | 9.35 | 0.00 | 89.57 |
| 42 | Meherpur | 63858 | 0.91 | 0.00 | 5.51 | 0.00 | 93.57 |
| 43 | Narail | 62436 | 1.07 | 0.00 | 6.20 | 0.00 | 92.72 |
| 44 | Satkhira | 180422 | 1.01 | 0.00 | 7.77 | 0.00 | 91.22 |
| Rajshahi Division | | 1722794 | 1.12 | 5.24 | 3.74 | 0.00 | 89.90 |
| 45 | Bogura | 332952 | 1.04 | 9.58 | 2.03 | 0.00 | 87.36 |
| 46 | Joypurhat | 93133 | 0.98 | 0.00 | 7.25 | 0.00 | 91.77 |
| 47 | Naogaon | 251806 | 1.06 | 0.00 | 2.40 | 0.00 | 96.54 |
| 48 | Natore | 162754 | 1.08 | 0.00 | 4.15 | 0.00 | 94.77 |
| 49 | Chapainawabganj | 137453 | 1.32 | 0.00 | 7.38 | 0.00 | 91.30 |
| 50 | Pabna | 226828 | 1.18 | 10.23 | 4.28 | 0.00 | 84.30 |
| 51 | Rajshahi | 243342 | 1.11 | 7.16 | 6.39 | 0.00 | 85.34 |
| 52 | Sirajganj | 274525 | 1.21 | 6.45 | 1.00 | 0.00 | 91.34 |
| Rangpur Division | | 1922575 | 0.16 | 0.00 | 2.77 | 0.00 | 97.07 |
| 53 | Dinajpur | 360463 | 0.17 | 0.00 | 4.10 | 0.00 | 95.72 |
| 54 | Gaibandha | 308346 | 0.11 | 0.00 | 0.82 | 0.00 | 99.07 |
| 55 | Kurigram | 255851 | 0.15 | 0.00 | 1.65 | 0.00 | 98.20 |
| 56 | Lalmonirhat | 146268 | 0.21 | 0.00 | 2.75 | 0.00 | 97.05 |
| 57 | Nilphamari | 212304 | 0.21 | 0.00 | 5.57 | 0.00 | 94.22 |
| 58 | Panchagarh | 115113 | 0.21 | 0.00 | 1.84 | 0.00 | 97.96 |
| 59 | Rangpur | 362683 | 0.14 | 0.00 | 3.01 | 0.00 | 96.86 |
| 60 | Thakurgaon | 161548 | 0.21 | 0.00 | 1.74 | 0.00 | 98.05 |
| Sylhet Division | | 687643 | 1.13 | 21.34 | 4.10 | 0.00 | 73.43 |
| 61 | Habiganj | 151015 | 1.08 | 12.03 | 3.92 | 0.00 | 82.98 |
| 62 | Moulvibazar | 138680 | 1.08 | 18.26 | 5.33 | 0.00 | 75.34 |
| 63 | Sunamganj | 169073 | 1.15 | 5.55 | 3.00 | 0.00 | 90.30 |
| 64 | Sylhet | 228875 | 1.19 | 41.02 | 4.28 | 0.00 | 53.51 |
| Bangladesh | | 14036246 | 1.41 | 20.48 | 6.01 | 0.00 | 72.10 |

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Above calculation required energy consumption data for urban household lighting, which was calculated using the approach below.

Energy Consumption in Urban Household Lighting

Divisionwise urban electrification rate was obtained from Household income and expenditure survey (GOB, 2010) and was normalized for 2015 using the country's electrification rates in 2010 and 2015. Rest of the households in each district was assumed to consume kerosene for lighting. As discussed in the previous section. According to the BEPP norm and considering the reduced household size in 2015, kerosene consumption for urban household lighting was considered as 0.3 gallon/household/month. This was used to calculate the total amount of kerosene consumed for urban household lighting. Fuel mix for the urban household lighting is shown in Table 7.5.4.

Table 7.5.4: Fuel-Mix for Urban Household Lighting in Terms of Households

| Serial No. of District | Division/ District | Number of Urban Households | Household using kerosene for lighting | Household using Solar pV for lighting | Household using Electricity for lighting |
|----------------------------|--------------------|----------------------------|---------------------------------------|---------------------------------------|--|
| 1 | 2 | 3 | 4 | 5 | 6 |
| Barishal Division | | 715269 | 108077 | 0 | 607192 |
| 1 | Barguna | 82876 | 12523 | 0 | 70354 |
| 2 | Barishal | 197233 | 29802 | 0 | 167431 |
| 3 | Bhola | 143113 | 21624 | 0 | 121489 |
| 4 | Jhalakathi | 60720 | 9175 | 0 | 51545 |
| 5 | Patuakhali | 133030 | 20101 | 0 | 112929 |
| 6 | Pirojpur | 98296 | 14853 | 0 | 83444 |
| Chattogram Division | | 2429321 | 117093 | 0 | 2312228 |
| 7 | Bandarban | 30757 | 1482 | 0 | 29274 |
| 8 | Brahmanbaria | 206934 | 9974 | 0 | 196960 |
| 9 | Chandpur | 194487 | 9374 | 0 | 185113 |
| 10 | Chattogram | 857247 | 41319 | 0 | 815928 |
| 11 | Cumilla | 404537 | 19499 | 0 | 385038 |
| 12 | Cox's Bazar | 159713 | 7698 | 0 | 152014 |
| 13 | Feni | 106614 | 5139 | 0 | 101475 |
| 14 | Khagrachhari | 51372 | 2476 | 0 | 48896 |
| 15 | Lakshmipur | 140278 | 6761 | 0 | 133517 |
| 16 | Noakhali | 228045 | 10992 | 0 | 217053 |
| 17 | Rangamati | 49338 | 2378 | 0 | 46960 |
| Dhaka Division | | 5122691 | 44055 | 0 | 5078635 |
| 18 | Dhaka | 2026695 | 17430 | 0 | 2009265 |
| 19 | Faridpur | 161333 | 1387 | 0 | 159945 |
| 20 | Gazipur | 317333 | 2729 | 0 | 314604 |
| 21 | Gopalganj | 95943 | 825 | 0 | 95117 |
| 22 | Jamalpur | 216314 | 1860 | 0 | 214454 |

| Serial No. of District | Division/ District | Number of Urban Households | Household using kerosene for lighting | Household using Solar pV for lighting | Household using Electricity for lighting |
|--------------------------|--------------------|----------------------------|---------------------------------------|---------------------------------------|--|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 23 | Kishoreganj | 240871 | 2071 | 0 | 238799 |
| 24 | Madaripur | 96817 | 833 | 0 | 95984 |
| 25 | Manikganj | 124710 | 1073 | 0 | 123638 |
| 26 | Munshiganj | 120281 | 1034 | 0 | 119246 |
| 27 | Mymensingh | 443649 | 3815 | 0 | 439834 |
| 28 | Narayanganj | 259428 | 2231 | 0 | 257197 |
| 29 | Narsingdi | 183527 | 1578 | 0 | 181949 |
| 30 | Netrokona | 183976 | 1582 | 0 | 182394 |
| 31 | Rajbari | 91443 | 786 | 0 | 90656 |
| 32 | Shariatpur | 95178 | 819 | 0 | 94359 |
| 33 | Sherpur | 131103 | 1127 | 0 | 129975 |
| 34 | Tangail | 334090 | 2873 | 0 | 331217 |
| Khulna Division | | 1435952 | 194715 | 0 | 1241237 |
| 35 | Bagerhat | 136010 | 18443 | 0 | 117567 |
| 36 | Chuadanga | 106537 | 14446 | 0 | 92091 |
| 37 | Jashore | 252041 | 34177 | 0 | 217864 |
| 38 | Jhenaidah | 162162 | 21989 | 0 | 140172 |
| 39 | Khulna | 210163 | 28498 | 0 | 181665 |
| 40 | Kushtia | 183263 | 24850 | 0 | 158413 |
| 41 | Magura | 79060 | 10720 | 0 | 68339 |
| 42 | Meherpur | 63858 | 8659 | 0 | 55199 |
| 43 | Narail | 62436 | 8466 | 0 | 53969 |
| 44 | Satkhira | 180422 | 24465 | 0 | 155957 |
| Rajshahi Division | | 1722794 | 381082 | 0 | 1341712 |
| 45 | Bogura | 332952 | 73649 | 0 | 259303 |
| 46 | Joypurhat | 93133 | 20601 | 0 | 72532 |
| 47 | Naogaon | 251806 | 55699 | 0 | 196106 |
| 48 | Natore | 162754 | 36001 | 0 | 126753 |
| 49 | Chapainawabganj | 137453 | 30405 | 0 | 107049 |
| 50 | Pabna | 226828 | 50174 | 0 | 176654 |
| 51 | Rajshahi | 243342 | 53827 | 0 | 189515 |
| 52 | Sirajganj | 274525 | 60725 | 0 | 213800 |
| Rangpur Division | | 1922575 | 561200 | 0 | 1361376 |
| 53 | Dinajpur | 360463 | 105219 | 0 | 255244 |
| 54 | Gaibandha | 308346 | 90006 | 0 | 218340 |
| 55 | Kurigram | 255851 | 74683 | 0 | 181168 |

| Serial No. of District | Division/ District | Number of Urban Households | Household using kerosene for lighting | Household using Solar pV for lighting | Household using Electricity for lighting |
|------------------------|--------------------|----------------------------|---------------------------------------|---------------------------------------|--|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 56 | Lalmonirhat | 146268 | 42696 | 0 | 103572 |
| 57 | Nilphamari | 212304 | 61971 | 0 | 150332 |
| 58 | Panchagarh | 115113 | 33602 | 0 | 81512 |
| 59 | Rangpur | 362683 | 105867 | 0 | 256816 |
| 60 | Thakurgaon | 161548 | 47156 | 0 | 114392 |
| Sylhet Division | | 687643 | 57074 | 0 | 630569 |
| 61 | Habiganj | 151015 | 12534 | 0 | 138481 |
| 62 | Moulvibazar | 138680 | 11510 | 0 | 127170 |
| 63 | Sunamganj | 169073 | 14033 | 0 | 155040 |
| 64 | Sylhet | 228875 | 18997 | 0 | 209879 |
| Bangladesh | | 14,03,6246 | 14,63,297 | 0 | 1,25,72,949 |

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7.5.4 Biomass Fuels Consumption in Urban Commercial Units

Restaurants serving in the urban areas are mainly considered as urban commercial units. According to the Report of Hotel and Restaurant Survey 2009-10, there were 2, 75,324 hotels and restaurants operating in Bangladesh in 2009-10 (GOB, 2013b). This number was extrapolated to 2,91,704 based on the total population in 2015. Considering 70% of the restaurants are in urban areas, the number of urban commercial units in 2015 was found to be 2,04,193. This was used to calculate the number of urban commercial units in each district based on their population. It was found that there was one restaurant for every 271 people in urban areas. According to the BEPP survey, it was found that 66 percent of the fuels consumed in the urban commercial units were biomass fuels that accounted for 12 tonnes per commercial unit per year (GOB, 1987). Therefore, it was assumed that total energy consumption in each commercial units was 241.2 GJ per year (18 tonnes biomass fuels with the heating value of 13.4 MJ/kg). As the detailed data on the fuel types consumed in the restaurants were not available, it was assumed that 80% of the urban commercial units use natural gas, LPG or any other non-biomass fuels. Therefore, 20% of the energy requirement in urban commercial units was assumed to be met from biomass fuels (Table 7.6; column 8). Detailed calculation of this section is shown in Appendices VII.II and VII.III.

7.5.5 Biomass Fuels Consumption in Rural Agro Processing

Three major agro processing industries namely rice parboiling, sugarcane processing and tea processing have been considered in this study. Biomass fuels consumption in each of these sectors were calculated using different methods and, therefore, discussed separately.

Rice Parboiling

The biomass fuels consumption in rice parboiling was calculated following the conceptual diagram presented earlier in Figure 7.6. The amount of paddy produced in each district was obtained from Departmental of Agricultural Extension (DAE, 2015). Based on the fact that

70 kg rice produced from 100 kg paddy, the amount of paddy produced in each district has been calculated (GOB, 1987). It is also reported that 90% of the produced rice is parboiled (Ahiduzzaman, 2007). Considering the facts that 170 kg husk is required to parboil each tonne rice and the heating value of husks is 12.5 MJ/kg, the total theoretical energy requirement to parboil rice in each district has been calculated (GIZ,2017). It is reported that more than half of the husk produced (60% is assumed in this study) in rice mills is consumed for parboiling and the rest is sold for other application. Amount of husk production was calculated from BEPP data, which suggests that 22.5 kg husk is generated from 100 kg paddy. From these data, the amount of energy required from biomass fuels for parboiling was calculated (Table 7.6; column 9). Detailed calculation of this section is shown in Appendices VII.II and VII.III.

Sugarcane Processing

A conceptual diagram showing the calculation approach for biomass consumption in sugar cane processing industries was shown in Figure 7.7. District-wise sugarcane production data have been obtained from BBS agricultural yearbook (GOB, 2017). Sugar is produced only in few districts and the amount of sugarcane consumed in those districts was obtained from the annual report of sugar mill corporation (BSFIC, 2016). Considering the facts that 32% of sugarcane remains as bagasse and the heating value of bagasse is 11.3 MJ/kg, total energy consumed in sugar mills from bagasse in each district has been calculated (GOB, 1987; Rahman, 2016a). It was also reported that Ghur industry consumed 60% of sugarcane produced in Bangladesh (Rahman, 2016b). Similarly, total energy consumed from bagasse in ghur industries in each district has been calculated. It is also assumed that bagasse is the only form of biomass consumed in the sugar mills and ghur industries.

Tea Processing

District-wise tea production data have been obtained from BBS agricultural yearbook (GOB, 2017). It was reported that 43.2 MJ thermal energy is required to process 1 kg tea (Taulo & Sebitosi, 2015, Tiwari & Chauhan, 2016). In addition, Bangladesh tea industry consumes approximately 3,220 tons of kerosene (The Daily Star, 2013). This kerosene was assumed to be consumed in proportion to the amount of tea processed in each facility. Energy from kerosene has been considered as the only non-biomass thermal energy source, and therefore total biomass fuels energy consumption has been calculated. Finally, the total biomass fuels energy consumption in rural agro processing sector in each district was computed by adding the biomass fuels energy consumption from sugar, ghur and tea processing industries (Table 7.6; column 10). Detailed calculation of this section as well as calculated data is shown in Appendices VII.II and VII.III, respectively.

7.5.6 Biomass Fuels Consumption in Non-agro Processing Industries

Figure 7.9 presented the conceptual diagram showing the calculation approach for biomass fuels consumption in brick kilns. Brick kilns are considered as the main industry under the ‘non-agro processing industries’ category. The number of each type of brick kiln in different districts has been obtained from Department of Environment (DOE) (Choudhury & Ahmed, 2019). Considering the fact that total 23 billion bricks were produced in Bangladesh in 2015-

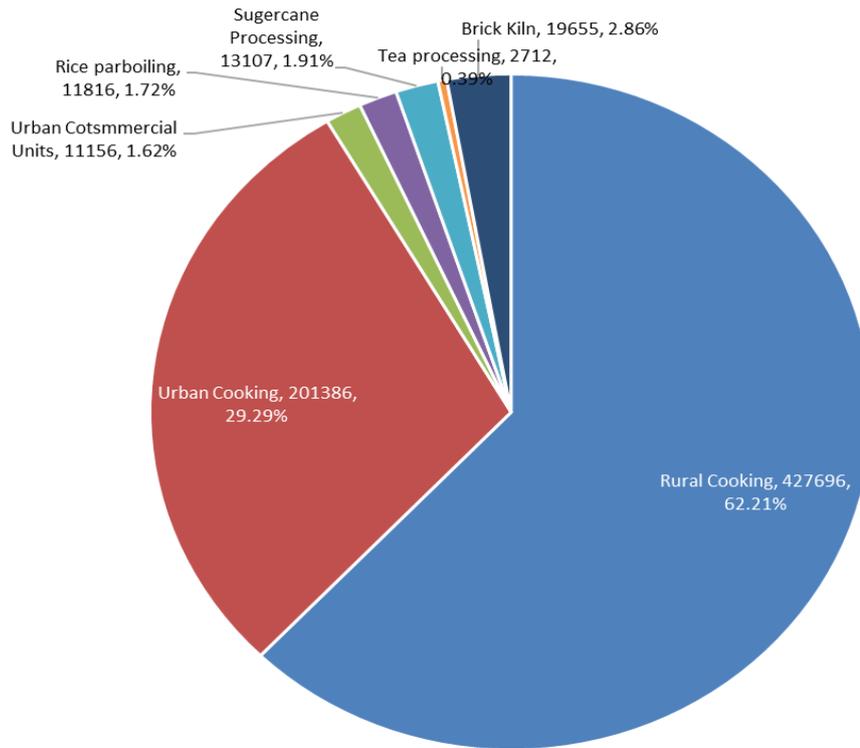
16, this was distributed among the kilns with equal weightage. To calculate the biomass fuels energy consumption in brick kiln, several assumptions have been made as listed in Table 7.3.

It is assumed that FCKs and tunnel kilns consume 22 and 20 tonnes coal/lakh bricks, respectively. On the other hand, the improved zigzag kilns, zigzag kilns and HHKs consume 14, 18 and 14 tonnes coal/lakh bricks, respectively (DOE, 2017). Since each district has different type of kilns, the weighted average coal consumption per kiln was calculated for the kilns located in each district. This weighted average was multiplied with the number of brick produced to calculate the theoretical energy consumption for brick production in each district. Heating value of coal has been considered as 24.4 MJ/kg (GOB, 1987). It was also reported that only 82% of energy required for brick production was obtained from coal (The Financial Express, 2018). Therefore, 18% of the total theoretical energy required for brick production is obtained from biomass fuels. Amount of biomass fuels consumed has been calculated considering average heating value of biomass fuels as 13.4 MJ/kg (Table 7.6; column 13). Detailed calculation procedure and relevant data set have been mentioned in Appendices VII.II and VII.III, respectively.

7.5.7 Summary of Biomass Fuels Consumption in 2015

As discussed earlier, five major sub-sectors namely rural household cooking, urban household cooking, urban commercial units, rural agro processing (rice parboiling, sugarcane processing and tea processing) and non-agro processing industry (brick kiln) were identified to assess the biomass fuels consumption pattern in every district of Bangladesh. A summarized table of biomass fuels energy consumption in each of these sectors in each district is shown in Table 7.6. The total amount of biomass fuels consumption in 2015 was calculated as 6,87,533 TJ, which is equivalent to 51.3 million tonnes (6,87,533/13.4) biomass fuels; of which 62.2% and 29.3% were for rural and urban household cooking, respectively. The rest of the three sectors combinedly consumed less than 10% of the total biomass fuels in 2015. 6,87,533 TJ This has been further explained in Figure 7.10.

Figure 7.10: Distribution of Consumptions of Biomass Fuels in 2015 (TJ)



Out of the seven divisions, Dhaka division was the highest biomass fuels consuming division (30%) followed by Rajshahi (16%) and Chattogram (16%) division. Barishal and Sylhet divisions consumed the least amount of biomass fuels (only 6% each). The number of households and population of these divisions were also less compared to other divisions.

Districtwise biomass fuels consumption patterns are found to follow the trend of population and households of the respective districts. Dhaka district consumed the highest amount of biomass fuels in 2015 (34,696 TJ), followed by Chattogram (26,686 TJ) and Mymensingh (25,743 TJ). On the other hand, Bandarban consumed the lowest biomass fuels (1776 TJ) in 2015. In general, the hill tracts area was found to be relatively lower biomass fuel consuming districts mainly because of their low population density.

On an average per capita biomass fuels consumption for Bangladesh was found to be 4.27 GJ (19.10 GJ per household) per annum. However, Natore had the highest per capita biomass fuels consumption (6.40 GJ), equivalent to 28.60 GJ per household and Dhaka district had the lowest per capita biomass fuels consumption (2.49 GJ), equivalent to 11.13 GJ per household. Although, the total biomass fuels consumption was lower for the three hill tract district, the per capita consumption was almost similar to the national average. This reconfirms that the lower overall biomass fuels consumption in these hill tract districts was because of their low population density, not because of the consumption patterns.

Table 7.6: Consumption of Biomass Fuels for Different End Uses in 2015

(In Terajoules)

| Serial No. of District | Division/ District | Total Number of Households | Number of Urban Households | Number of Rural Households | Biomass Fuel consumption (Terajoules) | | | | | | | Total |
|----------------------------|--------------------|----------------------------|----------------------------|----------------------------|--|---------------|------------------------|-----------------------|----------------------|----------------|-------------|----------------|
| | | | | | Rural Cooking | Urban Cooking | Urban Commercial units | Rural Agro Processing | | | Brick Kiln | |
| | | | | | | | | Rice parboiling | Sugarcane Processing | Tea Processing | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 = (6 to 12) |
| Barishal Division | | 2084726 | 715269 | 1369456 | 26581 | 12649 | 569 | 808 | 41 | 0 | 933 | 41581 |
| 1 | Barguna | 241551 | 82876 | 158675 | 3092 | 1503 | 61.0 | 91.6 | 0.4 | 0 | 122 | 4870 |
| 2 | Barishal | 574857 | 197233 | 377624 | 7273 | 3336 | 158.9 | 165.8 | 21.9 | 0 | 358 | 11313 |
| 3 | Bhola | 417118 | 143113 | 274005 | 5374 | 2639 | 121.4 | 228.1 | 11.1 | 0 | 159 | 8533 |
| 4 | Jhalakathi | 176975 | 60720 | 116255 | 2250 | 1039 | 46.7 | 57.0 | 2.9 | 0 | 99 | 3494 |
| 5 | Patuakhali | 387729 | 133030 | 254699 | 4929 | 2319 | 105.0 | 186.9 | 0.3 | 0 | 114 | 7655 |
| 6 | Pirojpur | 286495 | 98296 | 188198 | 3664 | 1813 | 76.1 | 78.9 | 3.9 | 0 | 81 | 5716 |
| Chattogram Division | | 6296465 | 2429321 | 3867144 | 74281 | 28108 | 2181 | 1607 | 130 | 275 | 4291 | 110872 |
| 7 | Bandarban | 89643 | 30757 | 58887 | 1142 | 514 | 26.5 | 29.0 | 1.9 | 0 | 64 | 1776 |
| 8 | Brahmanbaria | 603130 | 206934 | 396196 | 7551 | 2755 | 194.1 | 193.0 | 0.2 | 0 | 436 | 11130 |
| 9 | Chandpur | 566853 | 194487 | 372366 | 7156 | 2666 | 165.1 | 113.3 | 37.2 | 0 | 435 | 10573 |
| 10 | Chattogram | 1714494 | 857247 | 857247 | 16525 | 7732 | 758.6 | 251.7 | 29.1 | 273 | 1116 | 26686 |
| 11 | Cumilla | 1179064 | 404537 | 774527 | 14699 | 3323 | 368.2 | 368.5 | 11.1 | 0 | 830 | 19601 |
| 12 | Cox's Bazar | 465499 | 159713 | 305786 | 5929 | 2948 | 156.5 | 146.5 | 3.7 | 0 | 197 | 9381 |

| Serial No. of District | Division/ District | Total Number of Households | Number of Urban Households | Number of Rural Households | Biomass Fuel consumption (Terajoules) | | | | | | | |
|------------------------|--------------------|----------------------------|----------------------------|----------------------------|--|---------------|------------------------|-----------------------|----------------------|----------------|-------------|----------------|
| | | | | | Rural Cooking | Urban Cooking | Urban Commercial units | Rural Agro Processing | | | Brick Kiln | Total |
| | | | | | | | | Rice parboiling | Sugarcane Processing | Tea Processing | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 = (6 to 12) |
| 13 | Feni | 310738 | 106614 | 204124 | 3936 | 798 | 98.2 | 103.1 | 7.5 | 0 | 297 | 5240 |
| 14 | Khagrachhari | 149728 | 51372 | 98356 | 1915 | 879 | 42.0 | 41.3 | 13.7 | 0 | 77 | 2968 |
| 15 | Lakshmipur | 408855 | 140278 | 268577 | 5197 | 2344 | 118.2 | 123.5 | 2.8 | 0 | 245 | 8031 |
| 16 | Noakhali | 664660 | 228045 | 436615 | 8396 | 3317 | 212.4 | 216.6 | 4.5 | 0 | 541 | 12688 |
| 17 | Rangamati | 143801 | 49338 | 94463 | 1835 | 831 | 40.7 | 20.1 | 18.9 | 2 | 53 | 2801 |
| Dhaka Division | | 12141588 | 5122691 | 7018897 | 136417 | 56607 | 3978 | 2822 | 2213 | 0 | 6949 | 208987 |
| 18 | Dhaka | 3117992 | 2026695 | 1091297 | 21024 | 10680 | 1559.5 | 76.6 | 4.4 | 0 | 1352 | 34696 |
| 19 | Faridpur | 470221 | 161333 | 308888 | 5973 | 2820 | 130.7 | 84.6 | 624.3 | 0 | 296 | 9929 |
| 20 | Gazipur | 924898 | 317333 | 607566 | 11858 | 2723 | 232.7 | 117.7 | 58.8 | 0 | 921 | 15911 |
| 21 | Gopalganj | 279635 | 95943 | 183692 | 3546 | 1673 | 80.1 | 116.6 | 55.6 | 0 | 116 | 5588 |
| 22 | Jamalpur | 630470 | 216314 | 414156 | 8166 | 3968 | 156.7 | 249.9 | 746.2 | 0 | 191 | 13477 |
| 23 | Kishoreganj | 702043 | 240871 | 461172 | 9008 | 3897 | 199.0 | 321.7 | 2.3 | 0 | 339 | 13768 |
| 24 | Madaripur | 282183 | 96817 | 185366 | 3545 | 1571 | 79.7 | 46.9 | 66.3 | 0 | 193 | 5501 |
| 25 | Manikganj | 363481 | 124710 | 238770 | 4572 | 1668 | 95.2 | 77.2 | 56.6 | 0 | 243 | 6711 |
| 26 | Munshiganj | 350570 | 120281 | 230290 | 4388 | 1556 | 98.8 | 37.6 | 5.2 | 0 | 252 | 6337 |
| 27 | Mymensingh | 1293061 | 443649 | 849412 | 16643 | 7201 | 349.3 | 583.4 | 205.7 | 0 | 761 | 25743 |

| Serial No. of District | Division/ District | Total Number of Households | Number of Urban Households | Number of Rural Households | Biomass Fuel consumption (Terajoules) | | | | | | | |
|------------------------|--------------------|----------------------------|----------------------------|----------------------------|--|---------------|------------------------|-----------------------|----------------------|----------------|-------------|----------------|
| | | | | | Rural Cooking | Urban Cooking | Urban Commercial units | Rural Agro Processing | | | Brick Kiln | Total |
| | | | | | | | | Rice parboiling | Sugarcane Processing | Tea Processing | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 = (6 to 12) |
| 28 | Narayanganj | 756130 | 259428 | 496702 | 9574 | 1742 | 201.5 | 38.1 | 2.3 | 0 | 821 | 12379 |
| 29 | Narsingdi | 534908 | 183527 | 351381 | 6772 | 2341 | 152.1 | 93.7 | 3.5 | 0 | 437 | 9798 |
| 30 | Netrokona | 536218 | 183976 | 352241 | 6922 | 3379 | 152.4 | 386.5 | 1.6 | 0 | 98 | 10940 |
| 31 | Rajbari | 266520 | 91443 | 175077 | 3377 | 1554 | 71.8 | 56.9 | 196.2 | 0 | 198 | 5454 |
| 32 | Shariatpur | 277405 | 95178 | 182227 | 3528 | 1719 | 79.0 | 46.8 | 32.0 | 0 | 144 | 5549 |
| 33 | Sherpur | 382113 | 131103 | 251010 | 4951 | 2408 | 92.8 | 197.4 | 9.2 | 0 | 58 | 7716 |
| 34 | Tangail | 973741 | 334090 | 639650 | 12572 | 5708 | 246.4 | 290.7 | 143.1 | 0 | 530 | 19490 |
| Khulna Division | | 4185228 | 1435952 | 2749276 | 53660 | 26016 | 1072 | 1493 | 1816 | 0 | 2335 | 86392 |
| 35 | Bagerhat | 396415 | 136010 | 260405 | 5082 | 2459 | 100.9 | 120.7 | 59.8 | 0 | 90 | 7912 |
| 36 | Chuadanga | 310513 | 106537 | 203976 | 3966 | 1904 | 77.2 | 98.6 | 529.6 | 0 | 245 | 6820 |
| 37 | Jashore | 734599 | 252041 | 482558 | 9449 | 4761 | 189.0 | 307.1 | 44.8 | 0 | 476 | 15227 |
| 38 | Jhenaidah | 472636 | 162162 | 310475 | 6056 | 2937 | 121.1 | 227.1 | 440.2 | 0 | 275 | 10057 |
| 39 | Khulna | 612542 | 210163 | 402379 | 7812 | 3465 | 158.5 | 156.1 | 7.9 | 0 | 394 | 11993 |
| 40 | Kushtia | 534139 | 183263 | 350876 | 6872 | 3466 | 133.1 | 154.9 | 602.3 | 0 | 250 | 11478 |
| 41 | Magura | 230427 | 79060 | 151368 | 2945 | 1409 | 62.8 | 94.4 | 16.7 | 0 | 97 | 4625 |
| 42 | Meherpur | 186122 | 63858 | 122263 | 2391 | 1189 | 44.8 | 59.2 | 44.2 | 0 | 97 | 3825 |

| Serial No. of District | Division/ District | Total Number of Households | Number of Urban Households | Number of Rural Households | Biomass Fuel consumption (Terajoules) | | | | | | | |
|--------------------------|--------------------|----------------------------|----------------------------|----------------------------|--|---------------|------------------------|-----------------------|----------------------|----------------|-------------|----------------|
| | | | | | Rural Cooking | Urban Cooking | Urban Commercial units | Rural Agro Processing | | | Brick Kiln | Total |
| | | | | | | | | Rice parboiling | Sugarcane Processing | Tea Processing | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 = (6 to 12) |
| 43 | Narail | 181975 | 62436 | 119540 | 2333 | 1152 | 49.3 | 81.6 | 57.7 | 0 | 66 | 3740 |
| 44 | Satkhira | 525859 | 180422 | 345437 | 6753 | 3275 | 135.7 | 192.8 | 13.2 | 0 | 344 | 10714 |
| Rajshahi Division | | 5021260 | 1722794 | 3298465 | 64510 | 30821 | 1263 | 2131 | 6770 | 0 | 2754 | 108249 |
| 45 | Bogura | 970423 | 332952 | 637471 | 12540 | 5788 | 232.4 | 451.1 | 64.0 | 0 | 616 | 19691 |
| 46 | Joypurhat | 271447 | 93133 | 178314 | 3468 | 1701 | 62.5 | 195.2 | 272.0 | 0 | 104 | 5802 |
| 47 | Naogaon | 733914 | 251806 | 482108 | 9457 | 4838 | 177.7 | 529.3 | 70.6 | 0 | 427 | 15499 |
| 48 | Natore | 474363 | 162754 | 311609 | 6098 | 3069 | 116.6 | 165.9 | 3785.9 | 0 | 330 | 13566 |
| 49 | Chapainawabganj | 400622 | 137453 | 263168 | 5118 | 2497 | 112.6 | 155.9 | 352.1 | 0 | 259 | 8496 |
| 50 | Pabna | 661114 | 226828 | 434286 | 8458 | 3805 | 172.5 | 162.3 | 574.7 | 0 | 339 | 13512 |
| 51 | Rajshahi | 709246 | 243342 | 465903 | 9065 | 4132 | 177.4 | 212.6 | 1539.4 | 0 | 388 | 15514 |
| 52 | Sirajganj | 800132 | 274525 | 525607 | 10305 | 4990 | 211.7 | 258.8 | 111.2 | 0 | 291 | 16168 |
| Rangpur Division | | 4272390 | 1922575 | 2349814 | 46387 | 37137 | 1415 | 2010 | 2102 | 63 | 1783 | 90896 |
| 53 | Dinajpur | 801029 | 360463 | 440566 | 8636 | 6866 | 268.0 | 480.4 | 349.6 | 0 | 382 | 16982 |
| 54 | Gaibandha | 685213 | 308346 | 376867 | 7474 | 6079 | 213.3 | 253.7 | 329.9 | 0 | 316 | 14666 |
| 55 | Kurigram | 568559 | 255851 | 312707 | 6199 | 5000 | 185.5 | 215.2 | 19.7 | 0 | 207 | 11826 |
| 56 | Lalmonirhat | 325039 | 146268 | 178771 | 3536 | 2825 | 112.6 | 150.9 | 7.7 | 0 | 95 | 6727 |

| Serial No. of District | Division/ District | Total Number of Households | Number of Urban Households | Number of Rural Households | Biomass Fuel consumption (Terajoules) | | | | | | | |
|------------------------|--------------------|----------------------------|----------------------------|----------------------------|--|---------------|------------------------|-----------------------|----------------------|----------------|--------------|----------------|
| | | | | | Rural Cooking | Urban Cooking | Urban Commercial units | Rural Agro Processing | | | Brick Kiln | Total |
| | | | | | | | | Rice parboiling | Sugarcane Processing | Tea Processing | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 = (6 to 12) |
| 57 | Nilphamari | 471786 | 212304 | 259482 | 5101 | 3981 | 164.4 | 216.1 | 10.3 | 0 | 153 | 9626 |
| 58 | Panchagarh | 255808 | 115113 | 140694 | 2782 | 2244 | 88.5 | 137.8 | 414.1 | 63 | 61 | 5791 |
| 59 | Rangpur | 805961 | 362683 | 443279 | 8753 | 6990 | 258.3 | 342.4 | 421.5 | 0 | 428 | 17193 |
| 60 | Thakurgaon | 358995 | 161548 | 197447 | 3905 | 3152 | 124.6 | 213.2 | 549.0 | 0 | 142 | 8086 |
| Sylhet Division | | 2004207 | 687643 | 1316564 | 25860 | 10048 | 677 | 945 | 35 | 2380 | 609 | 40554 |
| 61 | Habiganj | 440149 | 151015 | 289134 | 5673 | 2494 | 142.8 | 250.3 | 17.9 | 616 | 194 | 9388 |
| 62 | Moulvibazar | 404197 | 138680 | 265517 | 5201 | 2079 | 131.2 | 189.7 | 8.4 | 1538 | 141 | 9288 |
| 63 | Sunamganj | 492780 | 169073 | 323707 | 6397 | 3038 | 168.7 | 274.0 | 8.3 | 0 | 48 | 9935 |
| 64 | Sylhet | 667081 | 228875 | 438205 | 8588 | 2437 | 234.7 | 231.4 | 0.0 | 226 | 226 | 11944 |
| Bangladesh | | 36005863 | 14036246 | 21969617 | 427696 | 201386 | 11156 | 11816 | 13107 | 2717 | 19655 | 687532 |

(Source: Please see Appendix-VII.2 for calculation methods and VII.3 for primary data)

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7.6 Projection of Biomass Fuels Consumption

Since more than 90 percent biomass fuels consumption was found in the urban and rural households cooking, the future projection of the biomass fuels consumption was performed for households cooking only. From the baseline data of 2015, projections were made for the years 2020, 2030 and 2040 for two different scenarios. Scenario 1 assumes the household LPG growth is at the rate of 15 percent of current domestic LPG consumption per annum up to 2020 and then reduce to 12 percent for the period 2021-2030 and 8 percent afterwards till 2040. On the other hand, scenario 2 assumes a higher penetration rate of LPG in the households and considers these growth rates as 20 percent till 2020, 15 percent for 2021-2030 and 10% afterwards. Table 7.7 summarizes the assumed LPG growth rates.

Table 7.7: Assumed LPG Growth Rate at Different time point used for future projection

| Scenarios | 2015 - 2020 | 2020 - 2030 | 2030-2040 |
|--|-------------|-------------|-----------|
| 1 | 2 | 3 | 4 |
| Scenario 1 (Low LPG growth rate) | 15% | 12% | 8% |
| Scenario 2 (High LPG growth rate) | 20% | 15% | 10% |

Projected LPG growth data is shown in Tables VII.XVIIa and VII.XVIIb. In 2015, population growth rate and urbanization rate were 1.12% and 3.4%, respectively (WB, 2018). These values were assumed to be same during the projection period. The projected population growth data and urban-rural distribution is shown in Tables VII.XVIII. In addition, the number of natural gas connections, amount of kerosene supplies and other parameters were kept unchanged during the projection period. Tables 7.7a and 7.7b show the percentage of rural and urban households using specific type of fuels in different time points, respectively. For low LPG growth rate, the number of biomass consuming household drops to 80.07% and 63.55% for rural and urban areas, respectively. However, for higher LPG growth rate, the number of biomass consuming household drops to 54.24% and 20.41% for rural and urban areas, respectively.

Table 7.7a: Projection of the Rural Households Using Specific Fuel in Different Years

| Scenario 1 | | | | |
|--------------------|--|---------------|---------------|---------------|
| Fuel Type | % of Rural Households Using Specific Fuel in Different Years | | | |
| | 2015 | 2020 | 2030 | 2040 |
| 1 | 2 | 3 | 4 | 5 |
| Kerosene | 1.21 | 1.27 | 1.54 | 2.28 |
| NG | 0.00 | 0.00 | 0.00 | 0.00 |
| LPG | 0.96 | 1.96 | 6.65 | 17.65 |
| Electricity | 0.00 | 0.00 | 0.00 | 0.00 |
| Biomass | 97.83 | 96.77 | 91.81 | 80.07 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 |
| Scenario 2 | | | | |
| Fuel Type | % of Rural Households Using Specific Fuel in Different Years | | | |
| | 2015 | 2020 | 2030 | 2040 |
| Kerosene | 1.21 | 1.27 | 1.54 | 2.28 |
| NG | 0.00 | 0.00 | 0.00 | 0.00 |
| LPG | 0.96 | 2.43 | 10.72 | 34.17 |
| Electricity | 0.00 | 0.00 | 0.00 | 0.00 |
| Biomass | 97.83 | 96.30 | 87.74 | 63.55 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 |

Table 7.7b: Projection of the Urban Households Using Specific Fuel in Different Years

| Scenario 1 | | | | |
|--------------------|--|---------------|---------------|---------------|
| Fuel Type | % of Urban Households Using Specific Fuel in Different Years | | | |
| | 2015 | 2020 | 2030 | 2040 |
| 1 | 2 | 3 | 4 | 5 |
| Kerosene | 1.41 | 1.16 | 0.77 | 0.48 |
| NG | 20.48 | 17.44 | 12.63 | 9.14 |
| LPG | 6.01 | 10.29 | 23.14 | 36.14 |
| Electricity | 0.00 | 0.00 | 0.00 | 0.00 |
| Biomass | 72.10 | 71.12 | 63.47 | 54.24 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 |
| Scenario 2 | | | | |
| Fuel Type | % of Urban Households Using Specific Fuel in Different Years | | | |
| | 2015 | 2020 | 2030 | 2040 |
| 1 | 2 | 3 | 4 | 5 |
| Kerosene | 1.41 | 1.16 | 0.77 | 0.48 |
| NG | 20.48 | 17.44 | 12.63 | 9.14 |
| LPG | 6.01 | 12.72 | 37.28 | 69.97 |
| Electricity | 0.00 | 0.00 | 0.00 | 0.00 |
| Biomass | 72.10 | 68.68 | 49.32 | 20.41 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 |

District wise biomass energy consumption patterns in the rural and urban households for the scenario 1 have been shown in Tables 7.8a and 7.8b. As expected, the biomass fuels based energy consumption in the rural household is decreasing with time because of the penetration of the LPG in the rural areas. However, the situation is not exactly same for the urban households. Because of the steady population growth and high urbanization rate (3.4%), urban population grew very rapidly. Assumed growth of LPG is not sufficient to reduce the biomass fuels consumption. Therefore, the total biomass fuels based energy consumption does not changes significantly over the time. In case of scenario 2, the domestic LPG growth rate is higher and therefore rural biomass fuels based energy consumption decreases rapidly. Similar trend was observed for urban household biomass fuels consumption (Tables 7.9a and 7.9b). At later time points, some of the districts show biomass fuels based energy consumption in urban households as negative. This means that urban areas of those districts will have sufficient energy from other sources and therefore, will not depend on biomass fuels anymore. Urban areas of Cumilla, Munshiganj and Manikganj will not consume biomass anymore in 2040 in case of scenario 1 as shown in Tables 7.8b. Because of higher domestic LPG growth rate, these districts will reach this status even earlier (2030) as shown in Table 7.9b.

Table 7.8a: Projection of Biomass Energy Consumption in Rural Households for Scenario 1

| Serial No. of District | Division/ District | Biomass Energy Consumption in Rural Households (TJ) | | | |
|----------------------------|--------------------|---|---------------|---------------|--------------|
| | | 2015 | 2020 | 2030 | 2040 |
| 1 | 2 | 3 | 4 | 5 | 6 |
| Barishal Division | | 26581 | 26023 | 23062 | 17013 |
| 1 | Barguna | 3092 | 3035 | 2723 | 2076 |
| 2 | Barishal | 7273 | 7077 | 6086 | 4120 |
| 3 | Bhola | 5374 | 5300 | 4868 | 3931 |
| 4 | Jhalakathi | 2250 | 2192 | 1898 | 1312 |
| 5 | Patuakhali | 4929 | 4815 | 4219 | 3016 |
| 6 | Pirojpur | 3664 | 3604 | 3268 | 2558 |
| Chattogram Division | | 74281 | 71654 | 60357 | 38862 |
| 7 | Bandarban | 1142 | 1111 | 956 | 648 |
| 8 | Brahmanbaria | 7551 | 7352 | 6339 | 4322 |
| 9 | Chandpur | 7156 | 7016 | 6261 | 4702 |
| 10 | Chattogram | 16525 | 15207 | 10769 | 3169 |
| 11 | Cumilla | 14699 | 14252 | 12025 | 7659 |
| 12 | Cox's Bazar | 5929 | 5844 | 5348 | 4280 |
| 13 | Feni | 3936 | 3861 | 3454 | 2611 |
| 14 | Khagrachhari | 1915 | 1869 | 1631 | 1153 |
| 15 | Lakshmipur | 5197 | 5112 | 4632 | 3619 |
| 16 | Noakhali | 8396 | 8242 | 7397 | 5638 |
| 17 | Rangamati | 1835 | 1787 | 1545 | 1062 |
| Dhaka Division | | 136417 | 132084 | 113528 | 78467 |
| 18 | Dhaka | 21024 | 18863 | 12114 | 1508 |
| 19 | Faridpur | 5973 | 5839 | 5137 | 3715 |
| 20 | Gazipur | 11858 | 11636 | 10432 | 7935 |
| 21 | Gopalganj | 3546 | 3466 | 3046 | 2195 |
| 22 | Jamalpur | 8166 | 8080 | 7532 | 6297 |
| 23 | Kishoreganj | 9008 | 8841 | 7928 | 6036 |
| 24 | Madaripur | 3545 | 3434 | 2884 | 1812 |
| 25 | Manikganj | 4572 | 4428 | 3715 | 2323 |
| 26 | Munshiganj | 4388 | 4235 | 3486 | 2041 |
| 27 | Mymensingh | 16643 | 16421 | 15102 | 12236 |
| 28 | Narayanganj | 9574 | 9346 | 8163 | 5784 |
| 29 | Narsingdi | 6772 | 6608 | 5762 | 4063 |
| 30 | Netrokona | 6922 | 6845 | 6360 | 5278 |
| 31 | Rajbari | 3377 | 3290 | 2844 | 1956 |
| 32 | Shariatpur | 3528 | 3463 | 3109 | 2372 |
| 33 | Sherpur | 4951 | 4895 | 4546 | 3769 |
| 34 | Tangail | 12572 | 12396 | 11366 | 9145 |
| Khulna Division | | 53660 | 52647 | 47152 | 35777 |
| 35 | Bagerhat | 5082 | 4984 | 4458 | 3370 |
| 36 | Chuadanga | 3966 | 3884 | 3447 | 2554 |
| 37 | Jashore | 9449 | 9321 | 8563 | 6919 |

| Serial No. of District | Division/ District | Biomass Energy Consumption in Rural Households (TJ) | | | |
|--------------------------|--------------------|---|---------------|---------------|---------------|
| | | 2015 | 2020 | 2030 | 2040 |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 38 | Jhenaidah | 6056 | 5942 | 5320 | 4033 |
| 39 | Khulna | 7812 | 7577 | 6410 | 4125 |
| 40 | Kushtia | 6872 | 6779 | 6230 | 5040 |
| 41 | Magura | 2945 | 2883 | 2558 | 1892 |
| 42 | Meherpur | 2391 | 2354 | 2143 | 1693 |
| 43 | Narail | 2333 | 2295 | 2079 | 1624 |
| 44 | Satkhira | 6753 | 6628 | 5945 | 4528 |
| Rajshahi Division | | 64510 | 63661 | 58599 | 47568 |
| 45 | Bogura | 12540 | 12405 | 11547 | 9620 |
| 46 | Joypurhat | 3468 | 3405 | 3063 | 2349 |
| 47 | Naogaon | 9457 | 9350 | 8681 | 7191 |
| 48 | Natore | 6098 | 6014 | 5522 | 4456 |
| 49 | Chapainawabganj | 5118 | 5025 | 4516 | 3456 |
| 50 | Pabna | 8458 | 8340 | 7648 | 6152 |
| 51 | Rajshahi | 9065 | 8913 | 8062 | 6272 |
| 52 | Sirajganj | 10305 | 10208 | 9560 | 8073 |
| Rangpur Division | | 46387 | 43991 | 35380 | 19993 |
| 53 | Dinajpur | 8636 | 8163 | 6447 | 3389 |
| 54 | Gaibandha | 7474 | 7120 | 5866 | 3614 |
| 55 | Kurigram | 6199 | 5895 | 4809 | 2864 |
| 56 | Lalmonirhat | 3536 | 3354 | 2700 | 1530 |
| 57 | Nilphamari | 5101 | 4807 | 3731 | 1817 |
| 58 | Panchagarh | 2782 | 2644 | 2151 | 1269 |
| 59 | Rangpur | 8753 | 8296 | 6653 | 3719 |
| 60 | Thakurgaon | 3905 | 3712 | 3023 | 1790 |
| Sylhet Division | | 25860 | 25508 | 23436 | 18945 |
| 61 | Habiganj | 5673 | 5598 | 5148 | 4171 |
| 62 | Moulvibazar | 5201 | 5122 | 4668 | 3701 |
| 63 | Sunamganj | 6397 | 6320 | 5850 | 4812 |
| 64 | Sylhet | 8588 | 8469 | 7770 | 6260 |
| Bangladesh | | 427696 | 415569 | 361514 | 256625 |

Compiled by: Choudhury and Ahmed

Table 7.8b: Projection of Biomass Energy Consumption in Urban Households for Scenario 1

| Serial No. of District | Division/ District | Biomass Energy Consumption in Urban Households (TJ) | | | |
|----------------------------|--------------------|---|--------------|--------------|--------------|
| | | 2015 | 2020 | 2030 | 2040 |
| 1 | 2 | 3 | 4 | 5 | 6 |
| Barishal Division | | 12649 | 13889 | 14900 | 14535 |
| 1 | Barguna | 1503 | 1677 | 1920 | 2092 |
| 2 | Barishal | 3336 | 3511 | 3093 | 1800 |
| 3 | Bhola | 2639 | 3040 | 3883 | 4904 |
| 4 | Jhalakathi | 1039 | 1103 | 1020 | 699 |
| 5 | Patuakhali | 2319 | 2506 | 2512 | 2133 |
| 6 | Pirojpur | 1813 | 2051 | 2473 | 2907 |
| Chattogram Division | | 28108 | 33001 | 39322 | 43034 |
| 7 | Bandarban | 514 | 540 | 471 | 265 |
| 8 | Brahmanbaria | 2755 | 2963 | 2625 | 1443 |
| 9 | Chandpur | 2666 | 3049 | 3520 | 3757 |
| 10 | Chattogram | 7732 | 10249 | 15789 | 22755 |
| 11 | Cumilla | 3323 | 3493 | 1845 | -2153 |
| 12 | Cox's Bazar | 2948 | 3382 | 4264 | 5306 |
| 13 | Feni | 798 | 1014 | 1299 | 1474 |
| 14 | Khagrachhari | 879 | 944 | 914 | 714 |
| 15 | Lakshmipur | 2344 | 2683 | 3282 | 3897 |
| 16 | Noakhali | 3317 | 3805 | 4518 | 5071 |
| 17 | Rangamati | 831 | 879 | 794 | 505 |
| Dhaka Division | | 56607 | 66662 | 81314 | 91842 |
| 18 | Dhaka | 10680 | 14442 | 20780 | 26128 |
| 19 | Faridpur | 2820 | 3066 | 3153 | 2833 |
| 20 | Gazipur | 2723 | 3373 | 4248 | 4817 |
| 21 | Gopalganj | 1673 | 1817 | 1857 | 1647 |
| 22 | Jamalpur | 3968 | 4672 | 6361 | 8617 |
| 23 | Kishoreganj | 3897 | 4393 | 5065 | 5510 |
| 24 | Madaripur | 1571 | 1595 | 1135 | 65 |
| 25 | Manikganj | 1668 | 1694 | 1079 | -337 |
| 26 | Munshiganj | 1556 | 1524 | 689 | -1089 |
| 27 | Mymensingh | 7201 | 8459 | 11144 | 14438 |
| 28 | Narayanganj | 1742 | 2085 | 2011 | 1126 |
| 29 | Narsingdi | 2341 | 2574 | 2484 | 1793 |
| 30 | Netrokona | 3379 | 3961 | 5323 | 7115 |
| 31 | Rajbari | 1554 | 1647 | 1505 | 994 |
| 32 | Shariatpur | 1719 | 1921 | 2211 | 2430 |
| 33 | Sherpur | 2408 | 2819 | 3777 | 5031 |
| 34 | Tangail | 5708 | 6620 | 8494 | 10724 |
| Khulna Division | | 26016 | 28933 | 32756 | 35087 |
| 35 | Bagerhat | 2459 | 2729 | 3066 | 3244 |
| 36 | Chuadanga | 1904 | 2092 | 2260 | 2234 |
| 37 | Jashore | 4761 | 5470 | 6966 | 8786 |

| Serial No. of District | Division/ District | Biomass Energy Consumption in Urban Households (TJ) | | | |
|---------------------------|--------------------|---|---------------|---------------|---------------|
| | | 2015 | 2020 | 2030 | 2040 |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 38 | Jhenaidah | 2937 | 3265 | 3692 | 3947 |
| 39 | Khulna | 3465 | 3545 | 2653 | 514 |
| 40 | Kushtia | 3466 | 3984 | 5084 | 6427 |
| 41 | Magura | 1409 | 1548 | 1665 | 1635 |
| 42 | Meherpur | 1189 | 1350 | 1652 | 1981 |
| 43 | Narail | 1152 | 1301 | 1560 | 1819 |
| 44 | Satkhira | 3275 | 3649 | 4158 | 4500 |
| Rajshahi Division | | 30821 | 35797 | 46542 | 59856 |
| 45 | Bogura | 5788 | 6865 | 9422 | 12818 |
| 46 | Joypurhat | 1701 | 1904 | 2210 | 2459 |
| 47 | Naogaon | 4838 | 5633 | 7488 | 9920 |
| 48 | Natore | 3069 | 3526 | 4486 | 5648 |
| 49 | Chapainawabganj | 2497 | 2794 | 3229 | 3570 |
| 50 | Pabna | 3805 | 4436 | 5747 | 7324 |
| 51 | Rajshahi | 4132 | 4706 | 5680 | 6632 |
| 52 | Sirajganj | 4990 | 5934 | 8280 | 11485 |
| Rangpur Division | | 37137 | 43079 | 56681 | 74282 |
| 53 | Dinajpur | 6866 | 7884 | 10029 | 12636 |
| 54 | Gaibandha | 6079 | 7153 | 9841 | 13530 |
| 55 | Kurigram | 5000 | 5848 | 7899 | 10653 |
| 56 | Lalmonirhat | 2825 | 3277 | 4315 | 5659 |
| 57 | Nilphamari | 3981 | 4517 | 5518 | 6604 |
| 58 | Panchagarh | 2244 | 2621 | 3526 | 4735 |
| 59 | Rangpur | 6990 | 8094 | 10586 | 13781 |
| 60 | Thakurgaon | 3152 | 3685 | 4967 | 6685 |
| Sylhet Division | | 10048 | 11976 | 16036 | 20965 |
| 61 | Habiganj | 2494 | 2922 | 3836 | 4957 |
| 62 | Moulvibazar | 2079 | 2434 | 3108 | 3856 |
| 63 | Sunamganj | 3038 | 3550 | 4704 | 6184 |
| 64 | Sylhet | 2437 | 3071 | 4387 | 5968 |
| Bangladesh | | 201386 | 233338 | 287550 | 339601 |

Compiled by: Choudhury and Ahmed

Note: Negative value indicates that urban areas of those districts will have sufficient energy from other sources by that time and therefore, will not depend on biomass fuels anymore.

Table 7.9a: Projection of Biomass Energy Consumption in Rural Households for Scenario 2

| Serial No. of District | Division/ District | Biomass Energy Consumption in Rural Households (TJ) | | | |
|----------------------------|--------------------|---|---------------|---------------|--------------|
| | | 2015 | 2020 | 2030 | 2040 |
| 1 | 2 | 3 | 4 | 5 | 6 |
| Barishal Division | | 26581 | 25863 | 21778 | 12771 |
| 1 | Barguna | 3092 | 3020 | 2603 | 1678 |
| 2 | Barishal | 7273 | 7013 | 5575 | 2431 |
| 3 | Bhola | 5374 | 5286 | 4755 | 3559 |
| 4 | Jhalakathi | 2250 | 2174 | 1751 | 826 |
| 5 | Patuakhali | 4929 | 4780 | 3939 | 2091 |
| 6 | Pirojpur | 3664 | 3590 | 3155 | 2186 |
| Chattogram Division | | 74281 | 71193 | 56661 | 26648 |
| 7 | Bandarban | 1142 | 1101 | 876 | 383 |
| 8 | Brahmanbaria | 7551 | 7288 | 5827 | 2629 |
| 9 | Chandpur | 7156 | 6978 | 5957 | 3698 |
| 10 | Chattogram | 16525 | 15138 | 10211 | 1324 |
| 11 | Cumilla | 14699 | 14099 | 10800 | 3613 |
| 12 | Cox's Bazar | 5929 | 5827 | 5210 | 3824 |
| 13 | Feni | 3936 | 3841 | 3294 | 2080 |
| 14 | Khagrachhari | 1915 | 1854 | 1516 | 773 |
| 15 | Lakshmipur | 5197 | 5092 | 4472 | 3088 |
| 16 | Noakhali | 8396 | 8202 | 7077 | 4580 |
| 17 | Rangamati | 1835 | 1772 | 1422 | 655 |
| Dhaka Division | | 136417 | 131322 | 107429 | 58312 |
| 18 | Dhaka | 21024 | 18681 | 10661 | -3294 |
| 19 | Faridpur | 5973 | 5799 | 4817 | 2658 |
| 20 | Gazipur | 11858 | 11577 | 9961 | 6378 |
| 21 | Gopalganj | 3546 | 3442 | 2853 | 1558 |
| 22 | Jamalpur | 8166 | 8071 | 7458 | 6050 |
| 23 | Kishoreganj | 9008 | 8796 | 7573 | 4861 |
| 24 | Madaripur | 3545 | 3395 | 2577 | 794 |
| 25 | Manikganj | 4572 | 4378 | 3313 | 997 |
| 26 | Munshiganj | 4388 | 4179 | 3045 | 582 |
| 27 | Mymensingh | 16643 | 16380 | 14773 | 11149 |
| 28 | Narayanganj | 9574 | 9275 | 7600 | 3923 |
| 29 | Narsingdi | 6772 | 6557 | 5355 | 2719 |
| 30 | Netrokona | 6922 | 6835 | 6280 | 5013 |
| 31 | Rajbari | 3377 | 3261 | 2619 | 1213 |
| 32 | Shariatpur | 3528 | 3446 | 2974 | 1926 |
| 33 | Sherpur | 4951 | 4887 | 4486 | 3570 |
| 34 | Tangail | 12572 | 12361 | 11085 | 8216 |
| Khulna Division | | 53660 | 52376 | 44980 | 28598 |
| 35 | Bagerhat | 5082 | 4958 | 4246 | 2671 |
| 36 | Chuadanga | 3966 | 3861 | 3260 | 1935 |
| 37 | Jashore | 9449 | 9297 | 8367 | 6273 |

| Serial No. of District | Division/ District | Biomass Energy Consumption in Rural Households (TJ) | | | |
|--------------------------|--------------------|---|---------------|---------------|---------------|
| | | 2015 | 2020 | 2030 | 2040 |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 38 | Jhenaidah | 6056 | 5911 | 5074 | 3219 |
| 39 | Khulna | 7812 | 7497 | 5765 | 1993 |
| 40 | Kushtia | 6872 | 6761 | 6091 | 4580 |
| 41 | Magura | 2945 | 2866 | 2417 | 1427 |
| 42 | Meherpur | 2391 | 2346 | 2076 | 1472 |
| 43 | Narail | 2333 | 2286 | 2006 | 1381 |
| 44 | Satkhira | 6753 | 6595 | 5678 | 3647 |
| Rajshahi Division | | 64510 | 63508 | 57374 | 43519 |
| 45 | Bogura | 12540 | 12389 | 11418 | 9196 |
| 46 | Joypurhat | 3468 | 3389 | 2934 | 1925 |
| 47 | Naogaon | 9457 | 9336 | 8566 | 6811 |
| 48 | Natore | 6098 | 5998 | 5394 | 4032 |
| 49 | Chapainawabganj | 5118 | 5001 | 4323 | 2819 |
| 50 | Pabna | 8458 | 8317 | 7464 | 5542 |
| 51 | Rajshahi | 9065 | 8876 | 7766 | 5295 |
| 52 | Sirajganj | 10305 | 10201 | 9507 | 7900 |
| Rangpur Division | | 46387 | 43865 | 34369 | 16651 |
| 53 | Dinajpur | 8636 | 8128 | 6166 | 2460 |
| 54 | Gaibandha | 7474 | 7114 | 5818 | 3456 |
| 55 | Kurigram | 6199 | 5885 | 4729 | 2599 |
| 56 | Lalmonirhat | 3536 | 3345 | 2623 | 1278 |
| 57 | Nilphamari | 5101 | 4779 | 3506 | 1075 |
| 58 | Panchagarh | 2782 | 2639 | 2111 | 1136 |
| 59 | Rangpur | 8753 | 8270 | 6446 | 3034 |
| 60 | Thakurgaon | 3905 | 3705 | 2970 | 1613 |
| Sylhet Division | | 25860 | 25441 | 22900 | 17175 |
| 61 | Habiganj | 5673 | 5584 | 5036 | 3800 |
| 62 | Moulvibazar | 5201 | 5104 | 4527 | 3236 |
| 63 | Sunamganj | 6397 | 6308 | 5753 | 4494 |
| 64 | Sylhet | 8588 | 8445 | 7584 | 5645 |
| Bangladesh | | 427696 | 413568 | 345492 | 203674 |

Compiled by: Choudhury and Ahmed

Table 7.9b: Projection of Biomass Energy Consumption in Urban Households for Scenario 2

| Serial No. of District | Division/ District | Biomass Energy Consumption in Urban Households (TJ) | | | |
|----------------------------|--------------------|---|--------------|--------------|--------------|
| | | 2015 | 2020 | 2030 | 2040 |
| 1 | 2 | 3 | 4 | 5 | 6 |
| Barishal Division | | 12649 | 13248 | 9765 | -2436 |
| 1 | Barguna | 1503 | 1617 | 1438 | 500 |
| 2 | Barishal | 3336 | 3256 | 1048 | -4958 |
| 3 | Bhola | 2639 | 2984 | 3433 | 3416 |
| 4 | Jhalakathi | 1039 | 1030 | 431 | -1247 |
| 5 | Patuakhali | 2319 | 2366 | 1393 | -1566 |
| 6 | Pirojpur | 1813 | 1995 | 2023 | 1419 |
| Chattogram Division | | 28108 | 31155 | 24539 | -5823 |
| 7 | Bandarban | 514 | 500 | 150 | -797 |
| 8 | Brahmanbaria | 2755 | 2707 | 575 | -5331 |
| 9 | Chandpur | 2666 | 2898 | 2305 | -259 |
| 10 | Chattogram | 7732 | 9970 | 13556 | 15378 |
| 11 | Cumilla | 3323 | 2882 | -3052 | -18338 |
| 12 | Cox's Bazar | 2948 | 3313 | 3713 | 3485 |
| 13 | Feni | 798 | 934 | 657 | -649 |
| 14 | Khagrachhari | 879 | 886 | 455 | -805 |
| 15 | Lakshmipur | 2344 | 2603 | 2640 | 1775 |
| 16 | Noakhali | 3317 | 3645 | 3238 | 842 |
| 17 | Rangamati | 831 | 818 | 301 | -1124 |
| Dhaka Division | | 56607 | 63616 | 56920 | 11224 |
| 18 | Dhaka | 10680 | 13716 | 14968 | 6921 |
| 19 | Faridpur | 2820 | 2906 | 1873 | -1397 |
| 20 | Gazipur | 2723 | 3138 | 2364 | -1410 |
| 21 | Gopalganj | 1673 | 1720 | 1086 | -902 |
| 22 | Jamalpur | 3968 | 4635 | 6062 | 7628 |
| 23 | Kishoreganj | 3897 | 4215 | 3641 | 807 |
| 24 | Madaripur | 1571 | 1442 | -96 | -4004 |
| 25 | Manikganj | 1668 | 1494 | -527 | -5644 |
| 26 | Munshiganj | 1556 | 1303 | -1077 | -6927 |
| 27 | Mymensingh | 7201 | 8295 | 9828 | 10089 |
| 28 | Narayanganj | 1742 | 1804 | -242 | -6319 |
| 29 | Narsingdi | 2341 | 2371 | 856 | -3586 |
| 30 | Netrokona | 3379 | 3921 | 5002 | 6054 |
| 31 | Rajbari | 1554 | 1535 | 606 | -1977 |
| 32 | Shariatpur | 1719 | 1854 | 1671 | 645 |
| 33 | Sherpur | 2408 | 2789 | 3536 | 4235 |
| 34 | Tangail | 5708 | 6480 | 7370 | 7009 |
| Khulna Division | | 26016 | 27849 | 24068 | 6374 |
| 35 | Bagerhat | 2459 | 2623 | 2221 | 451 |
| 36 | Chuadanga | 1904 | 1999 | 1510 | -242 |
| 37 | Jashore | 4761 | 5373 | 6185 | 6205 |

| Serial No. of District | Division/ District | Biomass Energy Consumption in Urban Households (TJ) | | | |
|--------------------------|--------------------|---|---------------|---------------|---------------|
| | | 2015 | 2020 | 2030 | 2040 |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 38 | Jhenaidah | 2937 | 3142 | 2707 | 690 |
| 39 | Khulna | 3465 | 3223 | 73 | -8013 |
| 40 | Kushtia | 3466 | 3915 | 4527 | 4585 |
| 41 | Magura | 1409 | 1477 | 1103 | -222 |
| 42 | Meherpur | 1189 | 1317 | 1384 | 1096 |
| 43 | Narail | 1152 | 1264 | 1265 | 846 |
| 44 | Satkhira | 3275 | 3516 | 3092 | 977 |
| Rajshahi Division | | 30821 | 35185 | 41641 | 43661 |
| 45 | Bogura | 5788 | 6800 | 8909 | 11122 |
| 46 | Joypurhat | 1701 | 1840 | 1697 | 763 |
| 47 | Naogaon | 4838 | 5575 | 7028 | 8401 |
| 48 | Natore | 3069 | 3462 | 3972 | 3952 |
| 49 | Chapainawabganj | 2497 | 2697 | 2458 | 1021 |
| 50 | Pabna | 3805 | 4344 | 5009 | 4884 |
| 51 | Rajshahi | 4132 | 4558 | 4498 | 2725 |
| 52 | Sirajganj | 4990 | 5908 | 8071 | 10793 |
| Rangpur Division | | 37137 | 42574 | 52635 | 60912 |
| 53 | Dinajpur | 6866 | 7743 | 8905 | 8921 |
| 54 | Gaibandha | 6079 | 7129 | 9649 | 12895 |
| 55 | Kurigram | 5000 | 5808 | 7578 | 9592 |
| 56 | Lalmonirhat | 2825 | 3239 | 4010 | 4649 |
| 57 | Nilphamari | 3981 | 4405 | 4619 | 3634 |
| 58 | Panchagarh | 2244 | 2601 | 3366 | 4204 |
| 59 | Rangpur | 6990 | 7990 | 9756 | 11039 |
| 60 | Thakurgaon | 3152 | 3658 | 4753 | 5977 |
| Sylhet Division | | 10048 | 11709 | 13893 | 13884 |
| 61 | Habiganj | 2494 | 2866 | 3386 | 3469 |
| 62 | Moulvibazar | 2079 | 2363 | 2546 | 1999 |
| 63 | Sunamganj | 3038 | 3501 | 4318 | 4909 |
| 64 | Sylhet | 2437 | 2978 | 3642 | 3507 |
| Bangladesh | | 201386 | 225335 | 223461 | 127797 |

Compiled by: Choudhury and Ahmed

Note: Negative value indicates that urban areas of those districts will have sufficient energy from other sources by that time and therefore, will not depend on biomass fuels anymore.

7.7 Conclusions and Suggestions

The main objective of the component 7 was to estimate specific biomass fuels consumption for different end uses according to districts. To achieve that, five major biomass fuels consuming sectors were identified in this study. Rural household cooking, urban household cooking, urban commercial units, rural agro processing (rice parboiling, sugarcane processing and tea processing) and non-agro processing industry (brick kiln) have been considered as they are the significant biomass consuming sectors in Bangladesh. The detailed analysis has

been performed based on the secondary data and relevant assumptions as discussed before. The future projection of the biomass consumption pattern in the domestic cooking sector have been performed for two scenarios based on assumed LPG growth rates. The key findings of this Component are mentioned below:

- The total amount of biomass fuels based energy consumption in 2015 for Bangladesh was calculated as 6,87,532 TJ; of which 62.2 percent and 29.3 percent were for rural and urban household cooking, respectively. The rest of the three sectors combinedly consumed less than 10 percent of the total biomass fuels.
- On an average per capita biomass fuels based energy consumption for Bangladesh was found to be 4.27 GJ (19.10 GJ per household) per annum.
- Distribution of total biomass fuels consumption in 2015 according to divisions, were as follows: Dhaka (30%), Rajshahi (16%), Chattogram (16%), Barishal (6%) and Sylhet (6%).
- In 2015, biomass fuels consumptions was highest in Dhaka District (34,696 TJ) followed by Chattogram (26686 TJ) and Mymensingh (25743 TJ).
- On the other hand, Bandarban consumed the lowest biomass fuels (1,776 TJ) in 2015. In general, the hill tracts area was relatively lower biomass fuels consuming districts mainly because of their lower population density.
- Yearly per capita biomass fuels consumption was highest in Natore (6.40 GJ), and lowest in Dhaka (2.49 GJ).
- In 2015, 97.83 percent households in the rural areas and 72.10 percent households in the urban areas consumed biomass fuels for cooking.
- For lower LPG growth rate (scenario 1), number of biomass consuming household drops to 85.92 percent and 66.22 percent in 2040 for rural and urban areas, respectively. For higher LPG growth rate, they are found to be 70.10 percent and 33.82 percent for rural and urban areas, respectively.
- The biomass fuels consumption in the rural household decreases with time because of the penetration of the LPG in the rural areas. However, because of the steady population growth and high urbanization rate, the overall biomass fuels consumption in the urban areas increases with time.
- Similar trend was observed for scenario 2. However, because of the higher LPG growth rate, urban household biomass fuels consumption increases very slightly and eventually drops after 2030.
- With a lower LPG growth, as assumed in scenario 1, the percentage of biomass-consuming household decreases, however, total amount of biomass consumption in urban and rural households increases because of population growth. This eventually decreased slightly after 2030, though the total biomass consumption will still be higher than 2015.
- On the other hand, for a higher LPG growth rate (scenario 2) the total biomass consumption in urban and rural households decreases rapidly after 2020 following a slight initial increase after 2015.

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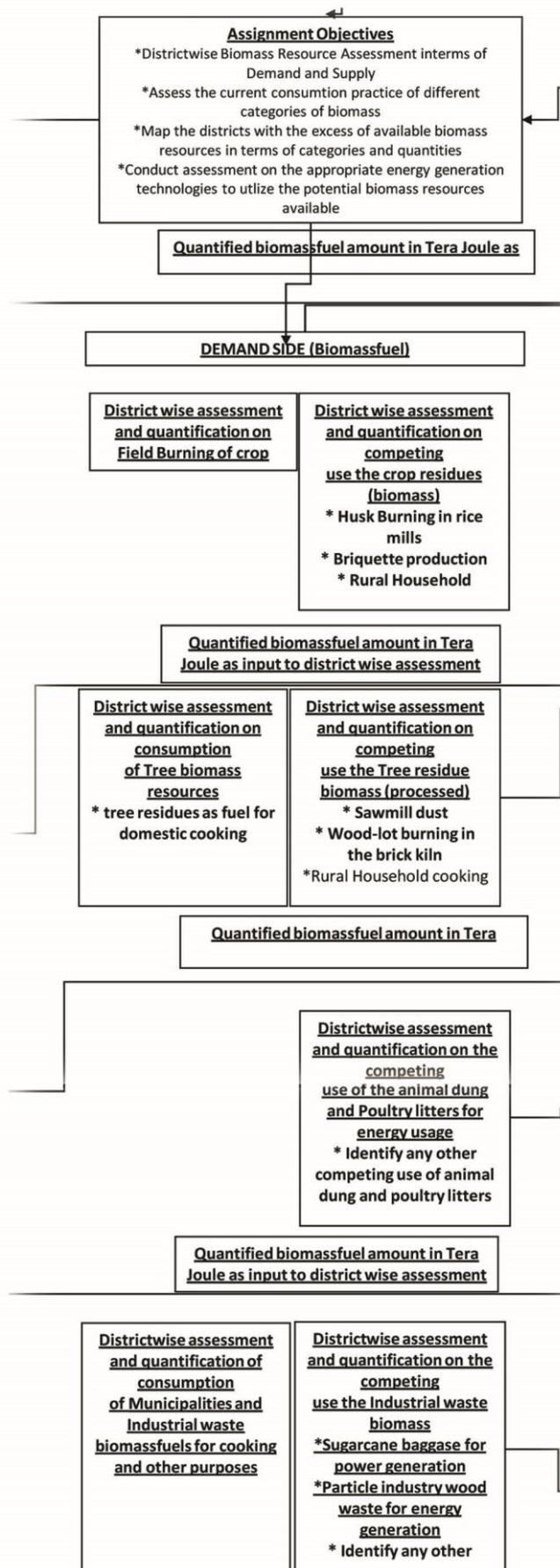
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APPENDICES -VII

Appendix VII.I: Conceptual Diagram and Analytical Equations



Appendix VII.II: Calculation Methods

1. Calculation of Biomass Fuels Consumption for Rural Household Cooking

Calculation of rural household cooking energy consumption from biomass has been performed following an indirect approach as shown in Figure 7.3. As mentioned earlier, districtwise population and household data were obtained from 2011 census (GOB, 2012) and extrapolated for 2015 by using the total population in 2015. According to the World Bank calculation, 65.69% population lived in rural areas in 2015. This ratio has been used for most of the districts except for few districts as mentioned in the Table 7.3. The urban – rural population ratios were adjusted for Dhaka and Chattogram districts as well as for all districts of Rangpur division. Since, according to 2011 census the rural and urban household distribution showed almost similar ratio as the population distribution, same ratio has been used for household. Calculated data has been shown in Table VII.11.

1. The number of rural households using electricity connections was obtained from REB Management Information System report (REB, 2016). It was assumed that there is no exclusive solar power user and therefore, difference between total households and electricity using households are the households using kerosene for lighting.
2. It is known that in 1987 kerosene consumption for rural lighting was 0.42 gallon/household/month (4.5 hr lighting/day) (GOB, 1987). However, it was also reported that modern lamps could consume 50% less fuel for the same lighting (GOB, 1987). Therefore, for 2015 this value was assumed as 0.16 gallon/household/month for rural area considering the correction for the average household size in 1987 and 2015. Thus the total amount of kerosene consumed for rural lighting has been calculated.
3. Divisionwise kerosene consumption for the year 2017-18 was obtained from Bangladesh Petroleum Corporation (BPC, 2018). This was calculated for 2015 using the ratio of the total amount of kerosene sold in 2015 and 2017. This was distributed among different districts based on their population. Kerosene consumption for rural cooking was calculated by deducting the kerosene consumption for lighting from total kerosene consumption. In 2015, no kerosene was consumed for power generation.
4. This was converted to theoretical energy consumption using the heating value 46.1 MJ/kg.
5. Districtwise LPG consumption data has been obtained through personal communication from LPG distribution companies and distributed into urban and rural areas as 80-20 ratio. It was assumed that 90% of rural LPG consumption was for domestic cooking. Considering 47.7 MJ/kg heating value for LPG, rural cooking energy from LPG has been calculated.
6. As per BEPP norm, energy required for domestic cooking has been considered as 19.90 GJ/household/year for 2015 considering the difference in the household size since 1987. This was multiplied by number of household to calculate the total energy requirement for rural cooking in each district.

7. Biomass energy consumption for rural cooking was calculated by subtracting the kerosene and LPG based cooking energy from the total rural cooking energy consumption (Table 7.6; column 6).

2. Calculation of Biomass Fuels Consumption in Urban Household Cooking

Calculation of urban household cooking energy consumption from biomass has been performed following an indirect approach as shown in Figure 7.4. As discussed in the rural household cooking section, similar population data and distribution behaviours have been considered. Calculated data has been shown in Table VII.12.

1. Divisionwise urban electrification rate was obtained from Household income and expenditure survey (GOB, 2010) and was normalized for 2015 using the country's electrification rates in 2010 and 2015. Number of urban households having electricity in each district was extrapolated based on population in each district.
2. Rest of the households in each district was assumed to consume kerosene for lighting. Considering As per BEPP norm and after performing the necessary correction for household size, kerosene consumption for lighting was considered as 0.3 and 0.2 gallon/household/month for urban and rural, respectively.
3. Kerosene consumption for urban cooking was calculated by deducting the kerosene consumption for lighting from the total kerosene consumption. It was assumed that no kerosene has been consumed for power generation. This was converted to theoretical energy consumption using the heating value 46.1 MJ/kg of kerosene.
4. The number of domestic natural gas (NG) connection in urban areas have been obtained through personal communication with different gas transmission companies (Choudhury & Ahmed, 2019). However, that data seems relatively high compared to actual household and therefore, might include some unofficial commercial connections declared as domestic. To address this issue only 70% of the total connection were considered as purely domestic. This value was deducted from the total urban household to obtain the number of urban household using non-NG fuels for cooking.
5. As per BEPP norm, energy required for domestic cooking has been considered as 19.90 GJ/household/year for 2015. This was multiplied by number of household to calculate total non-NG energy requirement for urban cooking in each district.
6. It was assumed that 90% of rural LPG consumption was for domestic cooking. Considering 47.7 MJ/kg heating value for LPG, rural cooking energy from LPG has been calculated.
7. As discussed in the rural household cooking section, similar LPG consumption behaviors have been considered. Considering 47.7 MJ/kg as heating value of LPG, urban cooking energy from LPG has been calculated. It is assumed that electric energy consumption for cooking is negligible compared to other options.

8. Biomass energy consumption for urban cooking was calculated by subtracting the kerosene and LPG based cooking energy from total non-NG urban domestic cooking energy consumption (Table 7.6; column 7).

3. Calculations of Biomass Fuels Consumption in Urban Commercial Units

1. According to the Report on Hotel and Restaurant Survey 2009-10, there were 275324 hotels and restaurants operating in Bangladesh in 2009-10 (GOB, 2013b). This number was corrected to 291704 based on the total population in 2015.
2. Assuming 70% of the restaurants are in urban areas, the urban commercial units in 2015 was 204193.
3. Urban population data of 2015 was used to calculate the average restaurant density in terms of one restaurant per specific number of people.
4. This was used to calculate the number of urban commercial units in each district based on their population.
5. From the BEPP survey, that total energy consumption in each commercial unit was considered to be 241.2 GJ per year (18 tonnes biomass fuels with the heating value of 13.4 MJ/kg).
6. From the number of urban commercial units in each district and the specific energy requirement of each commercial unit, total energy consumption was calculated.
7. It was assumed that 80% of the urban commercial units use natural gas, LPG or anyother nonbiomass fuels. Therefore, 20% of the energy requirement in urban commercial units was assumed to be met from biomass fuels.
8. These data were used to calculate biomass fuels energy consumption in the urban commercial units (Table 7.6; column 8). Calculated data has been shown in Table VII.13.

4. Calculations of Biomass Fuels Consumption in Rural Agro Processing

Rice Parboiling

1. Amount of paddy produced in each district was obtained from Departmental of Agricultural Extension (DAE, 2015).
2. Based on the fact that 70 kg rice produced from 100 kg paddy, the amount of paddy produced in each district has been calculated (GOB, 1987). Similarly, 22.5 kg husk is considered to be produced from 100 kg paddy.
3. Amount of parboiled rice was calculated from the fact that 90% of the produced rice is parboiled (Ahiduzzaman, 2007).
4. 170 kg husk is required to parboil each tonne rice and the heating value of husks was considered as 12.5 MJ/kg (GIZ,2017). These data were used to calculate theoretical energy requirement for rice parboiling.

5. 60% of the produced husk is consumed in the rice parboiling and the rest is sold for other applications. From this, the energy supplied by rice husk is calculated.
6. Difference between total energy requirement and the available husk-based energy is considered as the energy obtained from biomass fuels (Table 7.6; column 9). Calculated data has been shown in Table VII.14.

Sugercane Processing

1. District-wise sugarcane production data have been obtained from BBS agricultural yearbook (GOB, 2017).
2. Sugar is produced only in few districts and the amount of sugarcane consumed in those districts was obtained from the annual report of sugar mill corporation (BSFIC, 2016).
3. 32% of sugarcane was considered as bagasse and the heating value of bagasse was considered as 11.3 MJ/kg. In addition, it is assumed that all of the bagasse is consumed in the suger industry.
4. These data were used to calculate the total energy consumed in sugar mills from bagasse in each district.
5. It was also reported that Ghur industry consumed 60% of sugarcane produced in Bangladesh (Rahman, 2016b). This was used to calculate the energy consumption from bagasse in ghur making industries.
6. It is also assumed that bagasse is the only form of biomass consumed in the sugar mills and ghur industries. Similarly, total energy consumed from bagasse in ghur industries in each district has been calculated. Finally, the total biomass fuels energy consumption in sugarcane processing sector in each district was computed by adding the biomass fuels energy consumption from sugar and ghur processing industries (Table 7.6; column 10). Calculated data has been shown in Table VII.15.

Tea Processing

1. District-wise tea production data have been obtained from BBS agricultural yearbook (GOB, 2017).
2. It was reported that 43.2 MJ thermal energy is required to process 1 kg tea (Taulo & Sebitosi, 2015, Tiwari & Chauhan, 2016). This was used to calculate the total energy demand in Tea processing.
3. Bangladesh tea industry consumes approximately 3,220 tons of kerosene (The Daily Star, 2013). This kerosene was assumed to be consumed in proportion to the amount of tea processed in each facility.
4. Energy from kerosene has been considered as the only non-biomass thermal energy source, and therefore total biomass fuels energy consumption has been calculated from step 2 and 3 (Table 7.6; column 11). Calculated data has been shown in Table VII.15.

5. Calculations of Biomass Fuels Consumption in Non-agro Processing Industries

1. The number of each type of brick kiln in different districts has been obtained from Department of Environment (DOE) (Choudhury & Ahmed, 2019). This was distributed among the kilns with equal weightage.
2. It is assumed that FCKs and tunnel kilns consume 22 and 20 tonnes coal/lakh bricks, respectively. On the other hand, the improved zigzag kilns, zigzag kilns and HHKs consume 14, 18 and 14 tonnes coal/lakh bricks, respectively (DOE, 2017).
3. Since each district has different type of kilns, the weighted average coal consumption per kiln was calculated for the kilns located in each district. This weighted average was multiplied with the number of brick produced to calculate the theoretical energy consumption for brick production in each district.
4. According to previously reported data, it was considered that 82% energy in brick industry came from coal (The Financial Express, 2018). Heating value of coal has been considered as 24.4 MJ/kg (GOB, 1987).
5. Subsequently, it was considered that 18% of the total theoretical energy required for brick production is obtained from biomass. Amount of biomass fuels consumed has been calculated considering average heating value of biomass fuels as 13.4 MJ/kg (Table 7.6; column 12). Calculated data has been shown in Table VII.16.

Appendix VII.III: Raw Data Used for Calculation

Table VII.1: Household and Population distribution in different Districts

Area, Population, Household and Household Characteristics 35

2.03

Household, Population and Literacy Rate by Zila, 2011

| Division and zila | Np. of household | | | | Population | | | Sex Ratio (M/F) | Literacy Rate (7 Year+) |
|----------------------------|------------------|-----------------|---------------|---------------|------------------|-----------------|-----------------|-----------------|-------------------------|
| | Total | General | Institutional | Others | Both Sex | Male | Female | | |
| BANGLADESH | 32173630 | 31863396 | 26677 | 283557 | 144043697 | 72109796 | 71933901 | 100.2 | 51.77 |
| Barisal Division | 1862841 | 1855173 | 1148 | 6520 | 8325000 | 4089508 | 4236138 | 96.5 | 56.75 |
| Barguna | 215842 | 214863 | 148 | 831 | 892781 | 437413 | 455368 | 96.1 | 57.64 |
| Barisal | 513673 | 510780 | 425 | 2468 | 2324310 | 1137210 | 1187100 | 95.8 | 61.24 |
| Bhola | 372723 | 371799 | 132 | 792 | 1776795 | 884069 | 892726 | 99.0 | 43.24 |
| Jhalokati | 158139 | 157559 | 123 | 457 | 682669 | 329147 | 353522 | 93.1 | 66.68 |
| Patuakhali | 346462 | 345113 | 157 | 1192 | 1535854 | 753441 | 782413 | 96.3 | 54.07 |
| Pirojpur | 256002 | 255059 | 163 | 780 | 1113257 | 548228 | 565029 | 97.0 | 64.85 |
| Chittagong Division | 5626310 | 5581669 | 7167 | 37474 | 28423019 | 13933314 | 14489705 | 96.2 | 52.69 |
| Bandarban | 80102 | 78714 | 239 | 1149 | 388335 | 203350 | 184985 | 109.9 | 35.86 |
| Brahmanbaria | 538937 | 537560 | 261 | 1116 | 2840498 | 1366711 | 1473787 | 92.7 | 45.29 |
| Chandpur | 506521 | 503851 | 338 | 2332 | 2416018 | 1145831 | 1270187 | 90.2 | 56.78 |
| Chittagong | 1532014 | 1509717 | 3141 | 19156 | 7616352 | 3838854 | 37774998 | 101.6 | 58.91 |
| Coxilla | 1053572 | 1048984 | 1120 | 3468 | 5387288 | 2575018 | 2812270 | 91.6 | 53.32 |
| Cox's Bazar | 415954 | 413402 | 321 | 2231 | 2289990 | 1169604 | 1120386 | 104.4 | 39.29 |
| Feni | 277665 | 275461 | 419 | 1785 | 1437371 | 694128 | 743243 | 93.4 | 59.63 |
| Khagrachhari | 133792 | 132503 | 243 | 1046 | 613917 | 313793 | 300124 | 104.6 | 46.11 |
| Lakshmipur | 365339 | 364255 | 225 | 859 | 1729188 | 827780 | 901408 | 91.8 | 49.40 |
| Noakhali | 593918 | 590908 | 459 | 2651 | 3108083 | 1485169 | 1622914 | 91.5 | 51.29 |
| Rangamati | 128496 | 126414 | 401 | 1681 | 595979 | 313076 | 282903 | 110.7 | 49.73 |
| Dhaka Division | 10849315 | 10645520 | 11061 | 192734 | 47424418 | 24172317 | 23252101 | 104.0 | 54.19 |
| Dhaka | 2786133 | 2639630 | 5578 | 140925 | 12043977 | 6555792 | 5488185 | 119.5 | 70.54 |
| Faridpur | 420174 | 41855 | 372 | 1248 | 1912909 | 942245 | 970724 | 97.1 | 48.96 |
| Gazipur | 826458 | 809761 | 1164 | 15533 | 3403912 | 1775310 | 1628602 | 109.0 | 62.60 |
| Gopalganj | 249672 | 248735 | 225 | 912 | 1172415 | 577868 | 594547 | 97.2 | 58.09 |
| Jamalpur | 563367 | 562180 | 166 | 1021 | 2292674 | 1128724 | 1163950 | 97.0 | 38.44 |
| Kishoreganj | 627322 | 623914 | 223 | 3185 | 2911907 | 1432242 | 1479665 | 96.8 | 40.87 |
| Madaripur | 252149 | 251581 | 145 | 423 | 1165952 | 574582 | 591370 | 97.2 | 47.97 |
| Manikganj | 324794 | 323741 | 154 | 899 | 1392867 | 676359 | 716508 | 94.4 | 49.20 |
| Munshiganj | 313258 | 310664 | 320 | 2274 | 1445660 | 721552 | 724108 | 99.6 | 56.09 |
| Mymensingh | 1155436 | 1150574 | 611 | 4251 | 5110272 | 2539124 | 2571148 | 98.8 | 43.49 |
| Narayanganj | 675652 | 663088 | 619 | 11945 | 2948217 | 1521438 | 1426779 | 106.6 | 57.10 |
| Narsingdi | 477976 | 473937 | 393 | 3646 | 2224944 | 1102943 | 1122001 | 98.3 | 49.60 |
| Netrokona | 479146 | 477927 | 197 | 1022 | 2229642 | 1111306 | 1118336 | 99.4 | 39.44 |
| Rajbari | 238153 | 237352 | 114 | 687 | 1049778 | 519999 | 529779 | 98.2 | 52.28 |
| Shariatpur | 247880 | 246535 | 95 | 1250 | 1155824 | 559075 | 596749 | 93.7 | 47.26 |
| Sherpur | 341443 | 340769 | 121 | 553 | 13583225 | 676388 | 681937 | 99.2 | 37.91 |
| Tangail | 870102 | 866578 | 564 | 2960 | 3605083 | 1757370 | 1847713 | 95.1 | 46.79 |

Contd.

Source: BBS Yearbook 2017

2.03 Household, Population and Literacy Rate by Zila, 2011

| Division and zila | Np. of household | | | | Population | | | Sex Ratio (M/F) | Literacy Rate (7 Yers*) |
|--------------------------|------------------|----------------|---------------|--------------|-----------------|----------------|----------------|-----------------|-------------------------|
| | Total | General | Institutional | Others | Both Sex | Male | Female | | |
| Khulna Division | 3739779 | 3721281 | 2251 | 16247 | 15687759 | 7842533 | 7843226 | 100.0 | 53.23 |
| Bagerhat | 354223 | 350537 | 269 | 3417 | 1476090 | 740138 | 735952 | 100.6 | 58.98 |
| Chuadanga | 277464 | 276910 | 129 | 425 | 1129015 | 564819 | 564196 | 100.1 | 45.91 |
| Jessore | 6564113 | 653423 | 469 | 2521 | 2764547 | 1386293 | 1378254 | 100.6 | 56.52 |
| Jhenaidah | 422332 | 421300 | 173 | 859 | 1771304 | 886402 | 884902 | 100.2 | 48.40 |
| Khulna | 5473347 | 540504 | 612 | 6231 | 2318527 | 1175686 | 1142841 | 102.9 | 60.14 |
| Kushtia | 477289 | 475989 | 187 | 1113 | 1946838 | 973518 | 973320 | 100.0 | 46.33 |
| Magura | 205902 | 205492 | 113 | 297 | 918419 | 454739 | 463680 | 98.1 | 50.64 |
| Meherpur | 166312 | 165974 | 53 | 285 | 655392 | 324634 | 330758 | 98.1 | 46.27 |
| Narail | 162607 | 162299 | 74 | 234 | 721668 | 353527 | 368141 | 96.0 | 61.27 |
| Satkhira | 469890 | 468853 | 172 | 865 | 1985959 | 982777 | 1003182 | 98.0 | 52.07 |
| Rajshahi Division | 4486829 | 4472322 | 2232 | 12275 | 18484858 | 9256910 | 9227948 | 100.3 | 48.05 |
| Bogra | 867137 | 863600 | 505 | 3032 | 3400874 | 1708806 | 1692068 | 101.0 | 49.38 |
| Joypurhat | 242556 | 241994 | 115 | 447 | 913768 | 459284 | 454484 | 101.1 | 57.48 |
| Naogaon | 655801 | 654275 | 250 | 1276 | 2600157 | 1300227 | 1299930 | 100.0 | 48.22 |
| Natore | 423875 | 422921 | 188 | 766 | 1706673 | 854183 | 852490 | 100.2 | 49.59 |
| Nawabganj | 357982 | 357246 | 126 | 610 | 1647521 | 810218 | 837303 | 96.8 | 42.94 |
| Pabna | 590749 | 588891 | 238 | 1620 | 2523179 | 1262934 | 1260245 | 100.2 | 46.72 |
| Rajshahi | 633758 | 630331 | 520 | 2907 | 2595197 | 1309890 | 1285307 | 101.9 | 52.98 |
| Sirajganj | 714971 | 713064 | 290 | 1617 | 3097489 | 1551368 | 1546121 | 100.3 | 42.05 |
| Rangpur Division | 3817664 | 3807882 | 1718 | 8064 | 15787758 | 7881824 | 7905934 | 99.7 | 47.19 |
| Dinajpur | 715773 | 713255 | 429 | 2089 | 2990128 | 1508670 | 1481458 | 101.8 | 52.42 |
| Galbandha | 612283 | 611297 | 142 | 844 | 2379255 | 1169127 | 1210128 | 96.6 | 42.81 |
| Kurigram | 508045 | 507106 | 156 | 783 | 2069273 | 1010442 | 1058831 | 95.4 | 42.52 |
| Lalmonirhat | 290444 | 289953 | 139 | 352 | 1256099 | 628799 | 627300 | 100.2 | 46.09 |
| Nilphamari | 421572 | 420906 | 217 | 449 | 1834231 | 922964 | 911267 | 101.3 | 44.37 |
| Panchagarh | 228581 | 228074 | 96 | 411 | 987644 | 496725 | 490919 | 101.2 | 51.77 |
| Rangpur | 720180 | 717362 | 389 | 2429 | 2881086 | 1443816 | 1437270 | 100.5 | 48.55 |
| Thakurgaon | 320786 | 319929 | 150 | 707 | 1390042 | 701281 | 688761 | 101.8 | 48.71 |
| Sylhet Division | 1790892 | 1779549 | 1100 | 10243 | 9910219 | 4933390 | 4976829 | 99.1 | 45.01 |
| Habiganj | 393302 | 391657 | 164 | 1481 | 2089001 | 1025591 | 1063410 | 96.4 | 40.53 |
| Maulvibazar | 361177 | 3597715 | 158 | 1304 | 1919062 | 944728 | 974334 | 97.0 | 51.10 |
| Sunamganj | 440332 | 438752 | 134 | 1446 | 2467968 | 1236106 | 1231862 | 100.3 | 34.98 |
| Sylhet | 596081 | 589425 | 644 | 6012 | 3434188 | 1726965 | 1707223 | 101.2 | 51.18 |

Source: Population and Housing Census 2011, BBS

Table VII.2: District-wise production of different variants of rice in Bangladesh

| Serial No. of District | Division/District | Aus | | | | | | | | | Ropa Aman | | | | |
|------------------------|--------------------------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|
| | | Local Aus | | | Hyb Aus | | | Hybrid Aus | | | Local Ropa aman | | | Hyv Ropa ama | |
| | | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) |
| | (1) Barisal Division | | | | | | | | | | | | | | |
| 1 | Barguna | 1690 | 2974 | 1.7598 | 40870 | 106671 | 2.6100 | 570 | 2149 | 3.7702 | 71000 | 99400 | 1.4000 | 28850 | 72125 |
| 2 | Barisal | 12165 | 15815 | 1.3000 | 6705 | 16092 | 2.4000 | 0 | 0 | 0.0000 | 80419 | 144754.2 | 1.8000 | 45957 | 133275.3 |
| 3 | Bhola | 50570 | 75855 | 1.5000 | 33550 | 67100 | 2.0000 | 0 | 0 | 0.0000 | 83150 | 149670 | 1.8000 | 100500 | 301500 |
| 4 | Jhallokati | 2400 | 3600 | 1.5000 | 10500 | 27300 | 2.6000 | 35 | 119 | 3.4000 | 42275 | 84550 | 2.0000 | 8500 | 27200 |
| 5 | Patuakhali | 6930 | 11435 | 1.6501 | 23720 | 64044 | 2.7000 | 315 | 1166 | 3.7016 | 108548 | 195386 | 1.8000 | 101790 | 305370 |
| 6 | Pirojpur | 3895 | 4791 | 1.2300 | 13445 | 33613 | 2.5000 | 200 | 700 | 3.5000 | 53708 | 91986 | 1.7127 | 8440 | 24982.4 |
| | | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| | (2) Chittagong Division | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| 7 | Bandarban | 8937 | 12265 | 1.3724 | 2216 | 6847 | 3.0898 | 885 | 3336 | 3.7695 | 210 | 315 | 1.5000 | 11145 | 41236.5 |
| 8 | Brahmanbaria | 290 | 398 | 1.3724 | 7355 | 20439 | 2.7789 | 5 | 15 | 3.0000 | 4100 | 6355 | 1.5500 | 41700 | 119679 |
| 9 | Chandpur | 700 | 738 | 1.0543 | 9280 | 21828 | 2.3522 | 140 | 472 | 3.3714 | 3690 | 6321 | 1.7130 | 21010 | 59431 |
| 10 | Chittagong | 8060 | 9345 | 1.1594 | 19040 | 43430 | 2.2810 | 4980 | 18473 | 3.7094 | 31720 | 52649 | 1.6598 | 145290 | 422160 |
| 11 | Comilla | 193 | 284 | 1.4715 | 61515 | 156129 | 2.5381 | 3980 | 11284 | 2.8352 | 8720 | 15074 | 1.7287 | 99080 | 278088 |
| 12 | Cox's Bazar | 30 | 0 | 0.0000 | 3300 | 6390 | 1.9364 | 0 | 0 | 0.0000 | 4315 | 7724 | 1.7900 | 72690 | 216616 |
| 13 | Feni | 2410 | 3120 | 1.2946 | 6303 | 15657 | 2.4841 | 25 | 75 | 3.0000 | 6908 | 11079 | 1.6038 | 59497 | 186892 |
| 14 | Khagrachari | 2260 | 2928 | 1.2956 | 2040 | 4998 | 2.4500 | 0 | 0 | 0.0000 | 2412 | 4558.68 | 1.8900 | 25813 | 74599.57 |
| 15 | Lakshimpur | 7505 | 9757 | 1.3001 | 20280 | 49573 | 2.4444 | 45 | 135 | 3.0000 | 10020 | 17034 | 1.7000 | 67705 | 201084 |
| 16 | Noakhali | 13517 | 14630 | 1.0823 | 36905 | 85434 | 2.3150 | 0 | 0 | 0.0000 | 77313 | 121902 | 1.5767 | 78890 | 208698 |
| 17 | Rangamit | 6615 | 8004 | 1.2100 | 630 | 1449 | 2.3000 | 0 | 0 | 0.0000 | 240 | 396 | 1.6500 | 9080 | 24516 |
| | | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| | (3) Dhaka Division | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| 18 | Dhaka | 11 | 14 | 1.2727 | 738 | 1919 | 2.6003 | 0 | 0 | 0.0000 | 1050 | 1575 | 1.5000 | 7329 | 23452.8 |
| 19 | Faridpur | 4456 | 5792 | 1.2998 | 795 | 1778 | 2.2365 | 0 | 0 | 0.0000 | 2875 | 5032 | 1.7503 | 55880 | 169502 |
| 20 | Gazipur | 4 | 5 | 1.2500 | 1290 | 3251 | 2.5202 | 0 | 0 | 0.0000 | 4128 | 6192 | 1.5000 | 38497 | 103942 |
| 21 | Gopalganj | 2500 | 2107 | 0.8428 | 500 | 735 | 1.4700 | 0 | 0 | 0.0000 | 4500 | 7420 | 1.6489 | 5500 | 16885 |
| 22 | Jamalpur | 775 | 1102 | 1.4219 | 1329 | 3389 | 2.5500 | 0 | 0 | 0.0000 | 27510 | 46216.8 | 1.6800 | 74635 | 208978 |
| 23 | Kishorganj | 415 | 581 | 1.4000 | 25550 | 69241 | 2.7100 | 65 | 195 | 3.0000 | 4550 | 7735 | 1.7000 | 70150 | 203435 |
| 24 | Madaripur | 1182 | 1400 | 1.1844 | 264 | 553 | 2.0947 | 0 | 0 | 0.0000 | 4785 | 8613 | 1.8000 | 3375 | 9787 |
| 25 | Manikgonj | 149 | 168 | 1.1275 | 670 | 1735 | 2.5896 | 0 | 0 | 0.0000 | 180 | 297 | 1.6500 | 5390 | 15092 |
| 26 | Munshiganj | 62 | 106 | 1.7097 | 154 | 445 | 2.8896 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 270 | 864 |

| Serial No. of District | Division/District | Aus | | | | | | | | | Ropa Aman | | | | |
|------------------------|------------------------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|
| | | Local Aus | | | Hyb Aus | | | Hybrid Aus | | | Local Ropa aman | | | Hyv Ropa ama | |
| | | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) |
| 27 | Mymensingh | 0 | 0 | 0.0000 | 18228 | 45625 | 2.5030 | 10 | 33 | 3.3000 | 46755 | 77145.73 | 1.6500 | 210040 | 591949.6 |
| 28 | Narayanganj | 3 | 3 | 1.0000 | 275 | 781 | 2.8400 | 0 | 0 | 0.0000 | 832 | 1552 | 1.8654 | 2361 | 7092 |
| 29 | Narshingdi | 9 | 12 | 1.3333 | 308 | 792 | 2.5714 | 0 | 0 | 0.0000 | 8151 | 11411 | 1.4000 | 32000 | 70400 |
| 30 | Netrakhona | 100 | 122 | 1.2200 | 329 | 749 | 2.2766 | 0 | 0 | 0.0000 | 41240 | 72582.4 | 1.7800 | 96145 | 381695.65 |
| 31 | Rajbari | 1356 | 1956 | 1.4425 | 180 | 450 | 2.5000 | 0 | 0 | 0.0000 | 807 | 1307 | 1.6196 | 40911 | 122733 |
| 32 | Shariatpur | 7080 | 10620 | 1.5000 | 1500 | 3750 | 2.5000 | 320 | 864 | 2.7000 | 6324 | 12650 | 2.0003 | 1488 | 4620 |
| 33 | Sherpur | 600 | 1049 | 1.7483 | 1720 | 4281 | 2.4890 | 0 | 0 | 0.0000 | 34970 | 73437 | 2.1000 | 48000 | 151200 |
| 34 | Tangail | 1174 | 1939 | 1.6516 | 116 | 267 | 2.3017 | 0 | 0 | 0.0000 | 16734 | 26774 | 1.6000 | 75013 | 187533 |
| | | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| | (4) Khulna Division | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| 35 | Bagherhat | 667 | 1001 | 1.5007 | 4472 | 10628 | 2.3766 | 355 | 1154 | 3.2507 | 43318 | 75545 | 1.7440 | 26770 | 76630 |
| 36 | Chuadanga | 0 | | 0.0000 | 13135 | 40719 | 3.1000 | 14610 | 49238 | 3.3702 | 370 | 444 | 1.2000 | 33320 | 103292 |
| 37 | Jessore | 455 | 630 | 1.3846 | 19495 | 50571 | 2.5940 | 950 | 3019 | 3.1779 | 1560 | 2546 | 1.6321 | 120890 | 307590 |
| 38 | Jhenaikah | 120 | 180 | 1.5000 | 24258 | 74327 | 3.0640 | 1864 | 6654 | 3.5697 | 0 | 0 | 0.0000 | 98190 | 331882 |
| 39 | Khulna | 2285 | 2514 | 1.1002 | 480 | 898 | 1.8708 | 100 | 377 | 3.7700 | 24575 | 48547 | 1.9755 | 67050 | 220226 |
| 40 | Kustia | 7070 | 8043 | 1.1376 | 22605 | 62661 | 2.7720 | 225 | 788 | 3.5022 | 1070 | 1284 | 1.2000 | 81050 | 263413 |
| 41 | Magura | 965 | 1158 | 1.2000 | 4200 | 10000 | 2.3810 | 150 | 476 | 3.1733 | 1285 | 2313 | 1.8000 | 56305 | 167789 |
| 42 | Meherpur | 0 | | 0.0000 | 4085 | 12561 | 3.0749 | 4950 | 19681 | 3.9760 | 80 | 132 | 1.6500 | 24300 | 78975 |
| 43 | Narail | 4535 | 5232 | 1.1537 | 1025 | 2098 | 2.0468 | 200 | 551 | 2.7550 | 6620 | 9268 | 1.4000 | 24695 | 71615 |
| 44 | Satkhkhira | 0 | 0 | 0.0000 | 5730 | 15032 | 2.6234 | 295 | 864 | 2.9288 | 1675 | 2874 | 1.7158 | 82690 | 272454 |
| | | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| | (5) Rajshahi Division | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| 45 | Bogra | 0 | 0 | 0.0000 | 17591 | 41542 | 2.3615 | 1924 | 5772 | 3.0000 | 5500 | 11033 | 2.0000 | 177000 | 568689 |
| 46 | Joypurhat | 0 | 0 | 0.0000 | 141 | 395 | 2.8014 | 0 | 0 | 0.0000 | 570 | 1257 | 2.2053 | 68225 | 249236 |
| 47 | Naogaon | 0 | 0 | 0.0000 | 55370 | 151045 | 2.7279 | 1910 | 6710 | 3.5131 | 22390 | 42545 | 1.9002 | 179075 | 635720 |
| 48 | Natore | 756 | 1249 | 1.6521 | 5089 | 13753 | 2.7025 | 125 | 386 | 3.0880 | 1040 | 2255 | 2.1683 | 64075 | 206723 |
| 49 | Chapai Nawabganj | 10750 | 15088 | 1.4035 | 39800 | 107063 | 2.6900 | 0 | 0 | 0.0000 | 4620 | 8224 | 1.7801 | 48125 | 165947 |
| 50 | Pabna | 11612 | 16257 | 1.4000 | 9887 | 26201 | 2.6500 | 0 | 0 | 0.0000 | 698 | 1400 | 2.0057 | 50642 | 169221 |
| 51 | Rajshahi | 500 | 805 | 1.6100 | 37980 | 100556 | 2.6476 | 4485 | 16352 | 3.6459 | 2776 | 4858 | 1.7500 | 72554 | 255390 |
| 52 | Sirajganj | 1822 | 3316 | 1.8200 | 3920 | 9408 | 2.4000 | 76 | 236 | 3.1053 | 6542 | 11225 | 1.7158 | 54602 | 165172 |
| | | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| | (6) Rangpur Division | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| 53 | Dinajpur | 0 | 0 | 0.0000 | 6740 | 18468 | 2.7401 | 35 | 117 | 3.3429 | 6465 | 12348.15 | 1.9100 | 242203 | 704810.73 |
| 54 | Gaibandha | 0 | 0 | 0.0000 | 1045 | 2253 | 2.1560 | 5 | 15 | 3.0000 | 9354 | 16089 | 1.7200 | 83570 | 237339 |

| Serial No. of District | Division/District | Aus | | | | | | | | | Ropa Aman | | | | |
|------------------------|----------------------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|
| | | Local Aus | | | Hyb Aus | | | Hybrid Aus | | | Local Ropa aman | | | Hyb Ropa aman | |
| | | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) |
| 55 | Kurigram | 665 | 947 | 1.4241 | 806 | 1962 | 2.4342 | 200 | 722 | 3.6100 | 16853 | 29661 | 1.7600 | 65148 | 187626 |
| 56 | Lalmonirhat | 0 | 0 | 0.0000 | 3510 | 9617 | 2.7399 | 1210 | 4489 | 3.7099 | 130 | 237 | 1.8231 | 82388 | 237277 |
| 57 | Nilphamari | 0 | 0 | 0.0000 | 288 | 737 | 2.5590 | 85 | 252 | 2.9647 | 515 | 860 | 1.6699 | 100160 | 283453 |
| 58 | Panchagar | 110 | 193 | 1.7545 | 80 | 220 | 2.7500 | 0 | 0 | 0.0000 | 1335 | 2616.6 | 1.9600 | 89680 | 269040 |
| 59 | Rangpur | 0 | 0 | 0.0000 | 11190 | 32227 | 2.8800 | 2240 | 8467 | 3.7799 | 1425 | 2494 | 1.7502 | 151720 | 438471 |
| 60 | Thakurgaon | 0 | 0 | 0.0000 | 7462 | 22759 | 3.0500 | 2640 | 9636 | 3.6500 | 2575 | 5150 | 2.0000 | 120690 | 362070 |
| | | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| | (7) Sylhet Division | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| 61 | Habiganj | 250 | 375 | 1.5000 | 38085 | 103015 | 2.7049 | 0 | 0 | 0.0000 | 2735 | 4705 | 1.7203 | 64435 | 192660 |
| 62 | Maulavibazar | 287 | 430 | 1.4983 | 41808 | 113967 | 2.7260 | 125 | 375 | 3.0000 | 2957 | 5029 | 1.7007 | 94402 | 267158 |
| 63 | Sunamganj | 530 | 935 | 1.7642 | 5890 | 15020 | 2.5501 | 0 | 0 | 0.0000 | 15060 | 35901 | 2.3839 | 50510 | 153661 |
| 64 | Sylhet | 2461 | 3893 | 1.5819 | 43290 | 111223 | 2.5693 | 0 | 0 | 0.0000 | 49985 | 84986 | 1.7002 | 88268 | 253109 |

Source: Personal communication with Department of Agricultural Extension control room (collected and compiled by Agricultural Expert)

| an | | | | Bona Aman | | | Boro | | | | | | | | |
|--------|------------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|
| n | Hybrid Ropa Aman | | | Bona Aman | | | Local Boro | | | Hyb Boro | | | Hybrid Boro | | |
| | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) |
| | | | | | | | | | | | | | | | |
| 2.5000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 76 | 115 | 1.5132 | 364 | 1339 | 3.6780 | 29 | 114 | |
| 2.9000 | 0 | 0 | 0.0000 | 1048 | 1258 | 1.2004 | 4279 | 7592 | 1.7742 | 31150 | 116104 | 3.7292 | 10670 | 80825 | |
| 3.0000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 3384 | 5764 | 1.7033 | 28668 | 106630 | 3.7195 | 724 | 3261 | |
| 3.2000 | 0 | 0 | 0.0000 | 70 | 77 | 1.1000 | 48 | 88 | 1.8333 | 8541 | 33920 | 3.9714 | 108 | 518 | |
| 3.0000 | 2 | 7 | 3.5000 | 0 | 0 | 0.0000 | 569 | 957 | 1.6819 | 873 | 3044 | 3.4868 | 10 | 43 | |
| 2.9600 | 159 | 580.35 | 3.6500 | 2890 | 3468 | 1.2000 | 191 | 350 | 1.8325 | 12013 | 48405 | 4.0294 | 7608 | 36654 | |
| 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | |
| 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | |
| 3.7000 | 375 | 1548.75 | 4.1300 | 0 | 0 | 0.0000 | 11 | 23 | 2.0909 | 4977 | 16584 | 3.3321 | 1599 | 7923 | |
| 2.8700 | 0 | 0 | 0.0000 | 16200 | 22032 | 1.3600 | 119 | 207 | 1.7395 | 107589 | 410602 | 3.8164 | 4165 | 20596 | |
| 2.8287 | 5 | 18 | 3.6000 | 20465 | 20465 | 1.0000 | 593 | 991 | 1.6712 | 58743 | 217927 | 3.7098 | 5314 | 24246 | |
| 2.9056 | 1590 | 6360 | 4.0000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 54304 | 195148 | 3.5936 | 7593 | 35613 | |
| 2.8067 | 20 | 78 | 3.9000 | 30751 | 37516 | 1.2200 | 57 | 114 | 2.0000 | 145380 | 557641 | 3.8357 | 18622 | 90259 | |
| 2.9800 | 945 | 3619 | 3.8296 | 0 | 0 | 0.0000 | 1010 | 2252 | 2.2297 | 47168 | 170814 | 3.7486 | 8983 | 42394 | |
| 3.1412 | 5 | 17 | 3.4000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 25337 | 93261 | 3.6808 | 2336 | 10520 | |
| 2.8900 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 7332 | 26063 | 3.5547 | 3387 | 15353 | |
| 2.9700 | 535 | 2006 | 3.7495 | 3210 | 5104 | 1.5900 | 0 | 0 | 0.0000 | 20469 | 76335 | 3.7293 | 5022 | 23307 | |
| 2.6454 | 0 | 0 | 0.0000 | 210 | 252 | 1.2000 | 0 | 0 | 0.0000 | 20264 | 73605 | 3.6323 | 36016 | 169275 | |
| 2.7000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 4281 | 14887 | 3.4775 | 2949 | 13282 | |
| 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | |
| 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | |
| 3.2000 | 0 | 0 | 0.0000 | 7009 | 8761 | 1.2500 | 174 | 306 | 1.7586 | 50795 | 200289 | 3.9431 | 449 | 1977 | |
| 3.0333 | 495 | 2069 | 4.1798 | 10752 | 12623 | 1.1740 | 1479 | 2249 | 1.5206 | 21221 | 62075 | 2.9252 | 416 | 2034 | |
| 2.7000 | 0 | 0 | 0.0000 | 364 | 408 | 1.1209 | 226 | 444 | 1.9646 | 52542 | 210699 | 4.0101 | 8254 | 41298 | |
| 3.0700 | 8 | 33 | 4.1250 | 8100 | 8424 | 1.0400 | 142 | 248 | 1.7465 | 32730 | 126180 | 3.8552 | 40912 | 200731 | |
| 2.8000 | 3160 | 11060 | 3.5000 | 0 | 0 | 0.0000 | 683 | 1176 | 1.7218 | 113730 | 418615 | 3.6808 | 18053 | 86969 | |
| 2.9000 | 450 | 1485 | 3.3000 | 0 | 0 | 0.0000 | 417 | 1057 | 2.5348 | 147479 | 601405 | 4.0779 | 21897 | 115780 | |
| 2.8999 | 0 | 0 | 0.0000 | 9515 | 12997 | 1.3659 | 702 | 1294 | 1.8433 | 29551 | 104476 | 3.5354 | 1372 | 6731 | |
| 2.8000 | 5 | 16 | 3.2000 | 15725 | 15725 | 1.0000 | 957 | 1553 | 1.6228 | 45557 | 204438 | 4.4875 | 370 | 1005 | |
| 3.2000 | 0 | 0 | 0.0000 | 20174 | 16341 | 0.8100 | 311 | 505 | 1.6238 | 24628 | 98360 | 3.9938 | 68 | 320 | |

| an | | | | Bona Aman | | | Boro | | | | | | | | |
|--------|------------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|
| n | Hybrid Ropa Aman | | | Bona Aman | | | Local Boro | | | Hyb Boro | | | Hybrid Boro | | |
| | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) |
| 2.7400 | 2120 | 6996 | 3.3000 | 0 | 0 | 0.0000 | 186 | 377 | 2.0269 | 237771 | 921243 | 3.8745 | 35167 | 171678 | |
| 3.0038 | 0 | 0 | 0.0000 | 3625 | 4000 | 1.1200 | 304 | 864 | 2.8421 | 27630 | 103036 | 3.7291 | 256 | 1078 | |
| 2.2000 | 0 | 0 | 0.0000 | 1087 | 1304 | 1.1996 | 476 | 820 | 1.7227 | 56724 | 203294 | 3.5839 | 768 | 3384 | |
| 3.9700 | 750 | 2662.5 | 3.5500 | 0 | 0 | 0.0000 | 496 | 1052 | 2.1210 | 179676 | 692976 | 3.8568 | 10720 | 50509 | |
| 3.0000 | 1644 | 5918 | 3.5998 | 3044 | 3218 | 1.0572 | 177 | 297 | 1.6780 | 11348 | 39349 | 3.4675 | 440 | 1938 | |
| 3.1048 | 8 | 32 | 4.0000 | 7520 | 10152 | 1.3500 | 2417 | 3970 | 1.6425 | 26392 | 98166 | 3.7195 | 195 | 820 | |
| 3.1500 | 6140 | 22718 | 3.7000 | 0 | 0 | 0.0000 | 49 | 103 | 2.1020 | 62047 | 237397 | 3.8261 | 28795 | 124058 | |
| 2.5000 | 3 | 9.6 | 3.2000 | 19853 | 19853 | 1.0000 | 925 | 1547 | 1.6724 | 172128 | 656306 | 3.8129 | 2079 | 10177 | |
| 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | |
| 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | |
| 2.8625 | 622 | 2425 | 3.8987 | 660 | 0 | 0.0000 | 1597 | 3224 | 2.0188 | 24558 | 87753 | 3.5733 | 25147 | 117285 | |
| 3.1000 | 1780 | 6586 | 3.7000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 23820 | 89293 | 3.7487 | 3445 | 17035 | |
| 2.5444 | 4235 | 15520 | 3.6647 | 135 | 243 | 1.8000 | 0 | 0 | 0.0000 | 129825 | 490400 | 3.7774 | 18097 | 85054 | |
| 3.3800 | 960 | 4099 | 4.2698 | 50 | 68 | 1.3600 | 0 | 0 | 0.0000 | 69373 | 274832 | 3.9617 | 2890 | 14632 | |
| 3.2845 | 0 | 0 | 0.0000 | 4720 | 0 | 0.0000 | 161 | 318 | 1.9752 | 35297 | 135048 | 3.8260 | 16525 | 77668 | |
| 3.2500 | 2295 | 9524 | 4.1499 | 125 | 138 | 1.1040 | 0 | 0 | 0.0000 | 32086 | 127426 | 3.9714 | 1591 | 8570 | |
| 2.9800 | 675 | 2430 | 3.6000 | 670 | 1092 | 1.6299 | 0 | 0 | 0.0000 | 23674 | 94017 | 3.9713 | 2731 | 14332 | |
| 3.2500 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 15960 | 63692 | 3.9907 | 1742 | 9159 | |
| 2.9000 | 1780 | 6230 | 3.5000 | 4720 | 0 | 0.0000 | 24 | 48 | 2.0000 | 24376 | 89778 | 3.6830 | 14793 | 69059 | |
| 3.2949 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 63622 | 252164 | 3.9635 | 11888 | 56464 | |
| 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | |
| 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | |
| 3.2129 | 2000 | 6502 | 3.2510 | 0 | 0 | 0.0000 | 1564 | 2537 | 1.6221 | 178978 | 699347 | 3.9074 | 13284 | 67896 | |
| 3.6531 | 3375 | 14625 | 4.3333 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 58187 | 259264 | 4.4557 | 15873 | 82373 | |
| 3.5500 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 186241 | 761886 | 4.0909 | 10019 | 48802 | |
| 3.2263 | 375 | 1538 | 4.1013 | 19720 | 31946 | 1.6200 | 182 | 417 | 2.2912 | 56762 | 250062 | 4.4054 | 1552 | 7904 | |
| 3.4482 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 47553 | 185384 | 3.8985 | 691 | 3390 | |
| 3.3415 | 354 | 1429 | 4.0367 | 43194 | 62519 | 1.4474 | 536 | 1357 | 2.5317 | 47414 | 217486 | 4.5870 | 1730 | 9166 | |
| 3.5200 | 0 | 0 | 0.0000 | 95 | 171 | 1.8000 | 0 | 0 | 0.0000 | 64884 | 263770 | 4.0653 | 3937 | 19620 | |
| 3.0250 | 31 | 120 | 3.8710 | 20049 | 17896 | 0.8926 | 2180 | 4089 | 1.8757 | 134891 | 552837 | 4.0984 | 8501 | 40953 | |
| 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | |
| 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | |
| 2.9100 | 8082 | 27882.9 | 3.4500 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 161156 | 646652 | 4.0126 | 17741 | 84195 | |
| 2.8400 | 890 | 2946 | 3.3101 | 0 | 0 | 0.0000 | 853 | 1557 | 1.8253 | 101365 | 394753 | 3.8944 | 27902 | 134386 | |

| an | | | | Bona Aman | | | Boro | | | | | | | | |
|----|------------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|
| n | Hybrid Ropa Aman | | | Bona Aman | | | Local Boro | | | Hyb Boro | | | Hybrid Boro | | |
| | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) | yield (tns/ha) | Culti. Area (Ha) | Yield (M. Ton) |
| | 2.8800 | 4379 | 15633 | 3.5700 | 0 | 0 | 0.0000 | 2076 | 4087 | 1.9687 | 83301 | 308382 | 3.7020 | 25984 | 120600 |
| | 2.8800 | 2330 | 7526 | 3.2300 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 33837 | 130540 | 3.8579 | 17099 | 79696 |
| | 2.8300 | 11520 | 39839 | 3.4600 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 58198 | 220881 | 3.7953 | 25469 | 126186 |
| | 3.0000 | 5410 | 19259.6 | 3.5600 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 26257 | 112375 | 4.2798 | 5236 | 25087 |
| | 2.8900 | 10570 | 36784 | 3.4800 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 94825 | 353501 | 3.7279 | 40777 | 193147 |
| | 3.0000 | 12720 | 40704 | 3.2000 | 0 | 0 | 0.0000 | 0 | 0 | 0.0000 | 49849 | 188895 | 3.7893 | 7542 | 34031 |
| | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | | 0.0000 | | |
| | 2.9900 | 0 | 0 | 0.0000 | 29540 | 41356 | 1.4000 | 38 | 76 | 2.0000 | 80023 | 286796 | 3.5839 | 34189 | 149718 |
| | 2.8300 | 0 | 0 | 0.0000 | 2950 | 4248 | 1.4400 | 560 | 1136 | 2.0286 | 51234 | 188580 | 3.6808 | 2039 | 9383 |
| | 3.0422 | 0 | 0 | 0.0000 | 77 | 131 | 1.7013 | 7648 | 15553 | 2.0336 | 154159 | 507696 | 3.2933 | 28680 | 123563 |
| | 2.8675 | 0 | 0 | 0.0000 | 2895 | 4053 | 1.4000 | 9423 | 18627 | 1.9768 | 62424 | 229162 | 3.6711 | 3299 | 14891 |

| | RICE TOTAL |
|-------------------|------------|
| yield (tns/ha) | M. Ton |
| | |
| 3.9310 | 284887 |
| 4.8468 | 515776 |
| 4.5041 | 709780 |
| 4.7963 | 177372 |
| 4.3000 | 581452 |
| 4.8178 | 245530 |
| 0.0000 | 0 |
| 0.0000 | 0 |
| 4.9550 | 90078 |
| 4.9450 | 600323 |
| 4.5627 | 352437 |
| 4.6902 | 783178 |
| 4.8469 | 1146467 |
| 4.7194 | 455809 |
| 4.5034 | 320621 |
| 4.5329 | 128500 |
| 4.6410 | 384335 |
| 4.7000 | 673796 |
| 4.5039 | 62534 |
| 0.0000 | 0 |
| 0.0000 | 0 |
| 4.4031 | 238294 |
| 4.8894 | 263154 |
| 5.0034 | 366239 |
| 4.9064 | 362763 |
| 4.8174 | 777506 |
| 5.2875 | 1000914 |
| 4.9060 | 145851 |
| 2.7162 | 240029 |
| 4.7059 | 116941 |

| | RICE TOTAL |
|-------------------|------------|
| yield (tns/ha) | M. Ton |
| 4.8818 | 1815047 |
| 4.2109 | 118466 |
| 4.4063 | 291417 |
| 4.7117 | 1202349 |
| 4.4045 | 177166 |
| 4.2051 | 145644 |
| 4.3083 | 614243 |
| 4.8951 | 904406 |
| 0.0000 | 0 |
| 0.0000 | 0 |
| 4.6640 | 375645 |
| 4.9448 | 306607 |
| 4.6999 | 955573 |
| 5.0630 | 706674 |
| 4.7000 | 485596 |
| 5.3865 | 481847 |
| 5.2479 | 293607 |
| 5.2577 | 184200 |
| 4.6684 | 253879 |
| 4.7497 | 599852 |
| 0.0000 | 0 |
| 0.0000 | 0 |
| 5.1111 | 1403318 |
| 5.1895 | 607150 |
| 4.8709 | 1646708 |
| 5.0928 | 516233 |
| 4.9059 | 485096 |
| 5.2983 | 505036 |
| 4.9835 | 661522 |
| 4.8174 | 805252 |
| 0.0000 | 0 |
| 0.0000 | 0 |
| 4.7458 | 1494474 |
| 4.8164 | 789338 |

| | RICE TOTAL |
|----------------|------------|
| yield (tns/ha) | M. Ton |
| 4.6413 | 609620 |
| 4.6609 | 469382 |
| 4.9545 | 672228 |
| 4.7913 | 428791 |
| 4.7367 | 1065091 |
| 4.5122 | 663245 |
| 0.0000 | 0 |
| 0.0000 | 0 |
| 4.3791 | 778701 |
| 4.6018 | 590306 |
| 4.3083 | 852460 |
| 4.5138 | 719944 |

Table VII.3: District-wise production of Sugarcane in Bangladesh

Table: 3.5.1 Area and Production of Sugarcane by District 2013-14 to 2015-16

| Zila/Division | 2013-14 | | 214-15 | | 2015-16 | |
|---------------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| | Area (acres) | Production (MT) | Area (acres) | Production (MT) | Area (acres) | Production (MT) |
| 1 Barguna | 157 | 642 | 111 | 178 | 100 | 103 |
| 2 Barisal | 1608 | 10799 | 1385 | 10112 | 1362 | 9838 |
| 3 Bhola | 581 | 3198 | 796 | 5134 | 844 | 4941 |
| 4 Jhallokati | 262 | 1055 | 299 | 1350 | 286 | 1363 |
| 5 Patuakhali | 94 | 393 | 90 | 134 | 85 | 153 |
| 6 Pirojpur | 396 | 3553 | 394 | 1789 | 371 | 1802 |
| 1 Barisal | 3098 | 19640 | 3075 | 18697 | 3048 | 18200 |
| 7 Bandarban | 196 | 821 | 201 | 868 | 204 | 591 |
| 8 Brahmanbaria | 57 | 108 | 46 | 71 | 36 | 61 |
| 9 Chandpur | 1550 | 21798 | 1556 | 17141 | 1529 | 13107 |
| 10 Chittagang | 2851 | 12896 | 2819 | 13392 | 2829 | 3324 |
| 11 Comilla | 645 | 3528 | 700 | 5100 | 926 | 5775 |
| 12 Cox's Bazar | 746 | 4137 | 276 | 1705 | 759 | 4140 |
| 13 Feni | 340 | 3500 | 298 | 3437 | 291 | 3148 |
| 14 Khagrachhari | 606 | 6317 | 626 | 6294 | 638 | 6053 |
| 15 Laksmipur | 422 | 3688 | 341 | 1270 | 332 | 1230 |
| 16 Noakhali | 360 | 2053 | 368 | 2055 | 304 | 1686 |
| 17 Rangamati | 540 | 8698 | 533 | 8696 | 543 | 9591 |
| 2 Chittagang | 8313 | 67544 | 7764 | 60029 | 8391 | 48706 |
| 18 Dhaka | 300 | 2532 | 221 | 2040 | 201 | 1055 |
| 19 Faridpur | 12090 | 178030 | 11015 | 164395 | 10239 | 159212 |
| 20 Gazipur | 4398 | 32239 | 3034 | 27081 | 3045 | 26966 |
| 21 Gopalganj | 1877 | 24918 | 1907 | 25605 | 1766 | 23610 |
| 22 Jamalpur | 12843 | 260356 | 11941 | 246306 | 12088 | 233498 |
| 23 Kishorganj | 142 | 1136 | 140 | 1056 | 124 | 1019 |
| 24 Madaripur | 1407 | 22784 | 1352 | 30555 | 1300 | 25371 |
| 25 Manikganj | 4725 | 28504 | 4522 | 26075 | 4522 | 26075 |
| 26 Munshiganj | 295 | 2237 | 302 | 2412 | 290 | 2127 |
| 27 Mymensing | 5174 | 38320 | 6745 | 94815 | 5768 | 86251 |
| 28 Narayanganj | 172 | 964 | 170 | 1063 | 148 | 741 |
| 29 Narsingdi | 116 | 1203 | 137 | 1596 | 134 | 1612 |
| 30 Netrakona | 66 | 720 | 70 | 755 | 54 | 662 |
| 31 Rajbari | 8325 | 141695 | 5309 | 90436 | 5309 | 90436 |
| 32 Shariatpur | 1069 | 15109 | 1185 | 14761 | 1177 | 14881 |
| 33 Sherpur | 313 | 6572 | 207 | 4245 | 206 | 4373 |
| 34 Tangail | 3934 | 67915 | 3885 | 65949 | 3684 | 62540 |
| 3 Dhaka | 57246 | 825234 | 52142 | 799145 | 50055 | 760429 |

Contd.

| Zila/Division | | 2013-14 | | 2014-15 | | 2015-16 | |
|-------------------|------------------|---------------|-----------------|---------------|-----------------|---------------|-----------------|
| | | Area (acres) | Production (MT) | Area (acres) | Production (MT) | Area (acres) | Production (MT) |
| 35 | Bagerhat | 2205 | 27527 | 2216 | 27570 | 2248 | 26129 |
| 36 | Chuadanga | 5293 | 133592 | 8272 | 124529 | 4940 | 113010 |
| 37 | Jessore | 1273 | 23956 | 1346 | 20659 | 1087 | 19932 |
| 38 | Jhenaidah | 4015 | 95471 | 3728 | 85960 | 4322 | 122551 |
| 39 | Khulna | 255 | 3582 | 224 | 3664 | 104 | 1474 |
| 40 | Kushtia | 11932 | 240196 | 10259 | 211270 | 9820 | 200496 |
| 41 | Magura | 620 | 9145 | 537 | 7684 | 507 | 7167 |
| 42 | Meherpur | 1021 | 20056 | 1017 | 20353 | 1009 | 20196 |
| 43 | Narail | 1782 | 27514 | 1706 | 26596 | 1706 | 26647 |
| 44 | Satkhira | 1492 | 7608 | 314 | 6088 | 322 | 6315 |
| 4 | Khulna | 29888 | 588647 | 29619 | 534373 | 26065 | 543917 |
| 45 | Bogra | 1416 | 29028 | 1441 | 29521 | 1198 | 23995 |
| 46 | Joypurhat | 2426 | 49664 | 2326 | 51537 | 2239 | 47489 |
| 47 | Naogaon | 3679 | 58235 | 1608 | 32537 | 1437 | 28534 |
| 48 | Natore | 53278 | 1126717 | 59269 | 1284872 | 56432 | 1213101 |
| 49 | Chapai Nawabganj | 11830 | 161423 | 11963 | 162292 | 12081 | 163587 |
| 50 | Pabna | 9462 | 181162 | 9567 | 177415 | 9529 | 180595 |
| 51 | Rajshahi | 37325 | 703040 | 32020 | 592325 | 27579 | 503722 |
| 52 | Sirajganj | 3352 | 59611 | 3057 | 51250 | 3136 | 51154 |
| 5 | Rajshahi | 122768 | 2368880 | 121251 | 2381749 | 113631 | 2212177 |
| 53 | Dinajpur | 6482 | 93038 | 6013 | 87064 | 5842 | 84119 |
| 54 | Gaibandha | 6106 | 156638 | 5927 | 152052 | 5974 | 153152 |
| 55 | Kurigram | 473 | 5741 | 664 | 9099 | 712 | 10401 |
| 56 | Lalmonirhat | 281 | 3489 | 255 | 3537 | 264 | 3341 |
| 57 | Nilphamari | 187 | 4342 | 202 | 4761 | 190 | 4561 |
| 58 | Panchagarh | 10732 | 95200 | 10920 | 110017 | 10215 | 103915 |
| 59 | Rangpur | 4970 | 111930 | 4769 | 103516 | 4753 | 103105 |
| 60 | Thakurgaon | 11460 | 160696 | 11311 | 154073 | 10680 | 149665 |
| 6 | Rangpur | 40691 | 631074 | 40061 | 624119 | 38630 | 612259 |
| 61 | Habiganj | 2630 | 6014 | 3123 | 8256 | 2647 | 7481 |
| 62 | Maulvibazar | 301 | 941 | 197 | 3885 | 140 | 413 |
| 63 | Sunamganj | 155 | 325 | 290 | 3803 | 326 | 3996 |
| 64 | Sylhet | 22 | 45 | 10 | 14 | 10 | 14 |
| 7 | Sylhet | 3108 | 7325 | 3620 | 15958 | 3123 | 11904 |
| BANGLADESH | | 265112 | 4508344 | 257532 | 4434070 | 242943 | 4207592 |

Table VII.4: District-wise production of Tea in Bangladesh

Table: 3.7.1 Area and Production of Tea by District 2013-14 to 2015-16

| Zila/Division | 2013-14 | | 2014-15 | | 2015-16 | |
|---------------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| | Area (acres) | Production (MT) | Area (acres) | Production (MT) | Area (acres) | Production (MT) |
| 1 Barguna | - | - | - | - | 0 | 0 |
| 2 Barisal | - | - | - | - | 0 | 0 |
| 3 Bhola | - | - | - | - | 0 | 0 |
| 4 Jhallokati | - | - | - | - | 0 | 0 |
| 5 Patuakhali | - | - | - | - | 0 | 0 |
| 6 Pirojpur | - | - | - | - | 0 | 0 |
| 1 Barisal | - | - | - | - | 0 | 0 |
| 7 Bandarban | - | - | - | - | 303 | 70 |
| 8 Brahmanbaria | - | - | - | - | 0 | 0 |
| 9 Chandpur | - | - | - | - | 0 | 0 |
| 10 Chittagang | 16119 | 6800 | 16578 | 6643 | 16467 | 7140 |
| 11 Comilla | - | - | - | - | 0 | 0 |
| 12 Cox's Bazar | - | - | - | - | 0 | 0 |
| 13 Feni | - | - | - | - | 0 | 0 |
| 14 Khagrachhari | - | - | - | - | 0 | 0 |
| 15 Laksmipur | - | - | - | - | 0 | 0 |
| 16 Noakhali | - | - | - | - | 0 | 0 |
| 17 Rangamati | 378 | 40 | 378 | 40 | 379 | 30 |
| 2 Chittagang | 16497 | 6840 | 16956 | 6683 | 17149 | 7240 |
| 18 Dhaka | - | - | - | - | 0 | 0 |
| 19 Faridpur | - | - | - | - | 0 | 0 |
| 20 Gazipur | - | - | - | - | 0 | 0 |
| 21 Gopalganj | - | - | - | - | 0 | 0 |
| 22 Jamalpur | - | - | - | - | 0 | 0 |
| 23 Kishorganj | - | - | - | - | 0 | 0 |
| 24 Madaripur | - | - | - | - | 0 | 0 |
| 25 Manikganj | - | - | - | - | 0 | 0 |
| 26 Munshiganj | - | - | - | - | 0 | 0 |
| 27 Mymensing | - | - | - | - | 0 | 0 |
| 28 Narayanganj | - | - | - | - | 0 | 0 |
| 29 Narsingdi | - | - | - | - | 0 | 0 |
| 30 Netrakona | - | - | - | - | 0 | 0 |
| 31 Rajbari | - | - | - | - | 0 | 0 |
| 32 Shariatpur | - | - | - | - | 0 | 0 |
| 33 Sherpur | - | - | - | - | 0 | 0 |
| 34 Tangail | - | - | - | - | 0 | 0 |
| 3 Dhaka | - | - | - | - | 0 | 0 |

Contd.

Source: BBS Agricultural Yearbook 2016

| Zila/Division | | 2013-14 | | 2014-15 | | 2015-16 | |
|---------------|-------------------|---------------|-----------------|---------------|-----------------|---------------|-----------------|
| | | Area (acres) | Production (MT) | Area (acres) | Production (MT) | Area (acres) | Production (MT) |
| 35 | Bagerhat | - | - | - | - | 0 | 0 |
| 36 | Chuadanga | - | - | - | - | 0 | 0 |
| 37 | Jessore | - | - | - | - | 0 | 0 |
| 38 | Jhenaidah | - | - | - | - | 0 | 0 |
| 39 | Khulna | - | - | - | - | 0 | 0 |
| 40 | Kushtia | - | - | - | - | 0 | 0 |
| 41 | Magura | - | - | - | - | 0 | 0 |
| 42 | Meherpur | - | - | - | - | 0 | 0 |
| 43 | Narail | - | - | - | - | 0 | 0 |
| 44 | Satkhira | - | - | - | - | 0 | 0 |
| 4 | Khulna | * | * | * | * | 0 | 0 |
| 45 | Bogra | - | - | - | - | 0 | 0 |
| 46 | Joypurhat | - | - | - | - | 0 | 0 |
| 47 | Naogaon | - | - | - | - | 0 | 0 |
| 48 | Natore | - | - | - | - | 0 | 0 |
| 49 | Chapai Nawabganj | - | - | - | - | 0 | 0 |
| 50 | Pabna | - | - | - | - | 0 | 0 |
| 51 | Rajshahi | - | - | - | - | 0 | 0 |
| 52 | Sirajganj | - | - | - | - | 0 | 0 |
| 5 | Rajshahi | * | * | * | * | 0 | 0 |
| 53 | Dinajpur | - | - | - | - | 0 | 0 |
| 54 | Gaibandha | - | - | - | - | 0 | 0 |
| 55 | Kurigram | - | - | - | - | 0 | 0 |
| 56 | Lalmonirhat | - | - | - | - | 0 | 0 |
| 57 | Nilphamari | - | - | - | - | 0 | 0 |
| 58 | Panchagarh | 3800 | 1933 | 4821 | 1530 | 3875 | 3590 |
| 59 | Rangpur | - | - | - | - | 0 | 0 |
| 60 | Thakurgaon | - | - | - | - | 0 | 0 |
| 6 | Rangpur | 3800 | 1933 | 4821 | 1530 | 3875 | 3590 |
| 61 | Habiganj | 30772 | 15216 | 31498 | 14977 | 30917 | 14010 |
| 62 | Maulvibazar | 83525 | 37900 | 82980 | 37405 | 83340 | 34740 |
| 63 | Sunamganj | - | - | - | - | 0 | 0 |
| 64 | Sylhet | 13188 | 5611 | 13058 | 5506 | 13065 | 4920 |
| 7 | Sylhet | 127485 | 58727 | 127536 | 57888 | 127322 | 53670 |
| | BANGLADESH | 147782 | 67500 | 149313 | 66101 | 148346 | 64500 |

Table VII.5: District-wise distribution of different brick kilns in Bangladesh in 2016

| Sl. | | NO OF BRICK KILN | HAVE ENVIRONMENTAL | | Fixed (80-120' ft)Chimney | Zigzag | Hybrid Hoffman | Automatic/Tunnel Kiln | Alternative Tech | Total Environment Friendly Technology | Percentage |
|-----|--------------|------------------|--------------------|------------|---------------------------|------------|----------------|-----------------------|------------------|---------------------------------------|--------------|
| | | | Yes | No | | | | | | | |
| 1 | BARGUNA | 43 | 38 | 2 | 7 | 36 | | | | 36 | 83.72 |
| 2 | BARISAL | 120 | 105 | 15 | 51 | 67 | | | 2 | 69 | 57.5 |
| 3 | BHOLA | 57 | 46 | 7 | 7 | 48 | 2 | | | 50 | 87.72 |
| 4 | JHALAKATI | 31 | 28 | 3 | 24 | 7 | | | | 7 | 22.58 |
| 5 | PATUAKHALI | 38 | 34 | 4 | 17 | 21 | | | | 21 | 55.26 |
| 6 | PIROJPUR | 27 | 24 | 3 | 11 | 16 | | | | 16 | 59.26 |
| | Total | 315 | 275 | 34 | 117 | 195 | 2 | 0 | 2 | 199 | 63.17 |
| 7 | BANDARBON | 19 | 0 | 19 | 19 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | BRAHMANBARIA | 152 | 91 | 61 | 36 | 114 | 2 | 0 | | 116 | 76.32 |
| 9 | CHANDPUR | 146 | 98 | 48 | 53 | 78 | | 2 | | 80 | 54.79 |
| 10 | CHITTAGONG | 349 | 253 | 96 | 277 | 61 | 11 | 0 | | 72 | 20.63 |
| 11 | COMILLA | 302 | 290 | 12 | 12 | 285 | 5 | | | 290 | 96.03 |
| 12 | COX'SBAZAR | 67 | 45 | 22 | 22 | 45 | | | | 45 | 67.16 |
| 13 | FENI | 105 | 85 | 20 | 16 | 89 | | | | 89 | 84.76 |
| 14 | KHAGRACHHARI | 23 | 0 | 23 | 23 | 0 | | | | 0 | 0 |
| 15 | LAKSHMIPUR | 85 | 35 | 50 | 13 | 43 | | | | 43 | 50.59 |
| 16 | NOAKHALI | 191 | 156 | 35 | 32 | 157 | 2 | | | 159 | 83.25 |
| 17 | RANGAMATI | 16 | 0 | 16 | 16 | 0 | | | | 0 | 0 |
| | Total | 1455 | 1053 | 402 | 519 | 872 | 20 | 2 | 0 | 894 | 61.44 |
| 18 | DHAKA | 451 | 186 | 254 | 241 | 283 | 10 | 3 | 1 | 297 | 65.85 |
| 19 | FARIDPUR | 107 | 105 | 2 | 4 | 99 | 0 | 4 | | 103 | 96.26 |
| 20 | GAZIPUR | 296 | 257 | 65 | 196 | 113 | 2 | 11 | 0 | 126 | 42.57 |
| 21 | GOPALGONJ | 38 | 43 | 4 | 20 | 18 | 0 | 0 | 0 | 18 | 47.37 |

| | | | | | | | | | | | |
|--------------|-------------|-------------|-------------|------------|------------|-------------|-----------|-----------|----------|-------------|-------|
| 22 | JAMALPUR | 63 | 38 | 35 | 30 | 33 | 0 | 0 | 0 | 33 | 52.38 |
| 23 | KISHOREGANJ | 119 | 88 | 7 | 22 | 95 | 0 | 0 | 0 | 95 | 79.83 |
| 24 | MADARIPUR | 68 | 59 | 9 | 12 | 56 | | | | 56 | 82.35 |
| 25 | MANIKGANJ | 87 | 80 | 7 | 10 | 82 | 2 | 1 | | 85 | 97.7 |
| 26 | MUNSHIGANJ | 84 | 78 | 6 | 45 | 37 | 6 | 0 | 1 | 44 | 52.38 |
| 27 | MYMENSINGH | 253 | 111 | 142 | 113 | 132 | 2 | 6 | | 140 | 55.34 |
| 28 | NARAYANGANJ | 273 | 248 | 64 | 142 | 163 | 4 | 2 | | 169 | 61.9 |
| 29 | NARSINGDI | 157 | 119 | 20 | 11 | 138 | 0 | 1 | 0 | 139 | 88.54 |
| 30 | NETROKONA | 35 | 19 | 16 | 4 | 32 | | | | 32 | 91.43 |
| 31 | RAJBARI | 65 | 30 | 15 | 33 | 32 | 0 | 2 | | 34 | 52.31 |
| 32 | SHARIATPUR | 52 | 48 | 4 | 3 | 49 | | | | 49 | 94.23 |
| 33 | SHERPUR | 20 | 9 | 11 | 5 | 15 | | | | 15 | 75 |
| 34 | TANGAIL | 179 | 151 | 58 | 69 | 107 | 3 | | | 110 | 61.45 |
| Total | | 2347 | 1669 | 719 | 960 | 1484 | 29 | 30 | 2 | 1545 | 65.83 |
| 35 | BAGERHAT | 33 | 32 | 0 | 0 | 30 | 1 | 2 | | 33 | 100 |
| 36 | CHUADANGA | 80 | 24 | 56 | 43 | 37 | | | | 37 | 46.25 |
| 37 | JESSORE | 167 | 106 | 61 | 30 | 134 | | 3 | | 137 | 82.04 |
| 38 | JHENAIDAH | 92 | 50 | 42 | 39 | 53 | | | | 53 | 57.61 |
| 39 | KHULNA | 142 | 131 | 11 | 8 | 131 | | 3 | | 134 | 94.37 |
| 40 | KUSHTIA | 82 | 16 | 66 | 42 | 39 | | 1 | | 40 | 48.78 |
| 41 | MAGURA | 34 | 18 | 16 | 8 | 25 | | | 1 | 26 | 76.47 |
| 42 | MEHERPUR | 30 | 3 | 27 | 24 | 6 | | | | 6 | 20 |
| 43 | NARAIL | 23 | 16 | 7 | 5 | 18 | | | | 18 | 78.26 |
| 44 | SATKHIRA | 113 | 100 | 13 | 56 | 55 | | 2 | | 57 | 50.44 |
| Total | | 796 | 496 | 299 | 255 | 528 | 1 | 11 | 1 | 541 | 67.96 |
| 45 | BOGRA | 204 | 170 | 34 | 97 | 105 | 2 | | | 107 | 52.45 |
| 46 | JOYPURHAT | 34 | 25 | 9 | 19 | 16 | | | | 16 | 47.06 |
| 47 | NAOGAON | 142 | 113 | 29 | 63 | 79 | | | | 79 | 55.63 |
| 48 | NATORE | 115 | 91 | 24 | 27 | 87 | 1 | | | 88 | 76.52 |
| 49 | NAWABGANJ | 81 | 72 | 9 | 62 | 19 | | | | 19 | 23.46 |
| 50 | PABNA | 113 | 88 | 25 | 50 | 62 | 1 | | | 63 | 55.75 |

| | | | | | | | | | | | |
|--------------------|--------------|-------------|-------------|-------------|-------------|-------------|-----------|-----------|----------|-------------|--------------|
| 51 | RAJSHAHI | 131 | 74 | 57 | 52 | 75 | 4 | | | 79 | 60.31 |
| 52 | SIRAJGANJ | 96 | 95 | 1 | 47 | 49 | | | | 49 | 51.04 |
| Total | | 916 | 728 | 188 | 417 | 492 | 8 | 0 | 0 | 500 | 54.59 |
| 53 | DINAJPUR | 132 | 102 | 30 | 36 | 95 | 2 | | | 97 | 73.48 |
| 54 | GAIBANDHA | 106 | 75 | 31 | 44 | 61 | 1 | | | 62 | 58.49 |
| 55 | KURIGRAM | 68 | 59 | 9 | 35 | 32 | 1 | | | 33 | 48.53 |
| 56 | LALMONIRHAT | 32 | 30 | 2 | 12 | 20 | | | | 20 | 62.5 |
| 57 | NILPHAMARI | 51 | 45 | 6 | 24 | 25 | 2 | | | 27 | 52.94 |
| 58 | PANCHAGARH | 22 | 19 | 4 | 3 | 19 | 1 | | | 20 | 90.91 |
| 59 | RANGPUR | 147 | 105 | 42 | 48 | 98 | 5 | | | 103 | 70.07 |
| 60 | THAKURGAON | 45 | 37 | 8 | 31 | 14 | | | | 14 | 31.11 |
| Total | | 603 | 472 | 132 | 233 | 364 | 12 | 0 | 0 | 376 | 62.35 |
| 61 | HOBIGANJ | 68 | 65 | 3 | 13 | 55 | 0 | | | 55 | 80.88 |
| 62 | MOULAVIBAZAR | 49 | 48 | 1 | 11 | 38 | 0 | | | 36 | 77.55 |
| 63 | SUNAMGONJ | 17 | 17 | 0 | 3 | 14 | | | | 14 | 82.35 |
| 64 | SYLHET | 80 | 77 | 3 | 13 | 66 | 1 | | | 67 | 83.75 |
| Total | | 214 | 207 | 7 | 40 | 173 | 1 | 0 | 0 | 172 | 81.31 |
| Grand Total | | | | | | | | | | | |
| ডিসেম্বর ২০১৬ | | 6646 | 4900 | 1781 | 2541 | 4108 | 73 | 43 | 5 | 4227 | 63.63 |

Source: Personal communications (Choudhury & Ahmed 2019)

Table VII.6: Detailed connection statistics for REB

MANAGEMENT INFORMATION SYSTEM (MIS) STATEMENT
For the Month of December, 2016

SERVICES IN PLACE UPTO THIS MONTH
(THIS MONTH ONLY)

| PBS | DOMESTI | COMMERCIA | CHAR INST. | IRRIGATION | GP | LP | ST. LIGHT | SOLAR | TOTAL | PBS CODE |
|-----------------------------|-----------|-----------|------------|------------|--------|-------|-----------|-------|-----------|----------|
| 1. DHAKA PBS-1 | 324,916 | 26,092 | 1,841 | 772 | 3,215 | 1,208 | 144 | 0 | 358,247 | DD1USA |
| | 4,880 | 244 | 18 | 0 | 5 | 3 | 1 | 0 | 4,931 | |
| 2. TANGAIL PBS | 288,164 | 19,530 | 3,216 | 5,558 | 2,582 | 12 | 151 | 10 | 310,223 | DD8USA |
| | 4,351 | 157 | 22 | 2 | 8 | 0 | 0 | 0 | 4,540 | |
| 3. COMILLA PBS-1 | 275,527 | 21,142 | 4,269 | 4,294 | 2,448 | 47 | 440 | 0 | 308,166 | DD2USA |
| | 5,228 | 415 | 55 | 0 | 9 | 0 | 0 | 0 | 5,707 | |
| 4. CHANDPUR PBS-1 | 183,064 | 16,967 | 2,857 | 359 | 1,451 | 16 | 254 | 0 | 204,768 | CI10USA |
| | 1,851 | 189 | 24 | 0 | 6 | 0 | 0 | 0 | 2,079 | |
| 5. HOBIGONJ PBS | 220,596 | 20,418 | 3,459 | 1,330 | 2,068 | 103 | 445 | 0 | 248,409 | SI2USA |
| | 6,267 | 207 | 62 | 13 | 5 | 0 | 0 | 0 | 6,554 | |
| 6. MOULVIBAZAR PBS | 199,437 | 25,094 | 3,787 | 338 | 1,798 | 113 | 1,165 | 347 | 232,679 | SO6USA |
| | 2,980 | 224 | 48 | 17 | 6 | 0 | 0 | 0 | 3,285 | |
| 7. PABNA PBS-1 | 184,442 | 11,000 | 2,014 | 710 | 1,850 | 65 | 332 | 0 | 200,413 | R13USA |
| | 2,893 | 112 | 14 | 0 | 3 | 1 | 0 | 0 | 3,023 | |
| 8. PABNA PBS-2 | 204,249 | 13,129 | 2,209 | 1,164 | 2,073 | 2 | 214 | 2,489 | 225,529 | R11USA |
| | 3,062 | 65 | 18 | 0 | 5 | 0 | 0 | 0 | 3,150 | |
| 9. SIRAJGONJ PBS-1 | 217,233 | 16,542 | 2,631 | 3,877 | 2,721 | 14 | 517 | 235 | 243,871 | RO6USA |
| | 8,718 | 225 | 17 | 2 | 46 | 0 | 0 | 0 | 9,008 | |
| 10. JESSORE PBS-1 | 257,819 | 21,780 | 3,673 | 5,930 | 2,774 | 21 | 377 | 0 | 292,354 | K07USA |
| | 5,065 | 162 | 30 | 12 | 15 | 1 | 0 | 0 | 5,285 | |
| 11. JESSORE PBS-2 | 242,141 | 19,402 | 3,707 | 3,969 | 2,417 | 18 | 414 | 0 | 272,068 | K03USA |
| | 3,897 | 162 | 45 | 13 | 8 | 0 | 0 | 0 | 4,086 | |
| 12. NATORE PBS-1 | 216,134 | 13,423 | 3,899 | 3,540 | 1,793 | 54 | 255 | 5 | 239,103 | RD4USA |
| | 2,141 | 123 | 26 | 20 | 5 | 0 | 0 | 0 | 2,315 | |
| 13. NATORE PBS-2 | 214,322 | 10,910 | 2,820 | 1,899 | 2,012 | 6 | 441 | 2,042 | 234,252 | RD9USA |
| | 2,847 | 42 | 11 | 3 | 3 | 0 | 0 | 0 | 2,906 | |
| Total for PHASE-1 | 3,028,033 | 236,009 | 40,182 | 33,640 | 29,200 | 1,739 | 5,149 | 5,129 | 3,379,261 | |
| | 53,950 | 2,275 | 401 | 82 | 124 | 5 | 1 | 0 | 56,839 | |
| 14. RANGPUR PBS-1 | 209,154 | 20,776 | 3,127 | 7,017 | 2,135 | 52 | 94 | 0 | 242,355 | R16KFD |
| | 5,855 | 122 | 52 | 1 | 8 | 0 | 0 | 0 | 6,048 | |
| 15. SATKHIRA PBS | 221,787 | 19,788 | 4,188 | 2,677 | 2,370 | 86 | 159 | 21 | 251,075 | K14KFD |
| | 4,207 | 249 | 47 | 8 | 12 | 0 | 0 | 0 | 4,523 | |
| 16. FENI PBS | 267,232 | 25,871 | 4,175 | 34 | 2,100 | 2 | 260 | 0 | 299,674 | C15KFD |
| | 2,732 | 253 | 37 | 3 | 1 | 0 | 0 | 0 | 3,036 | |
| 17. MYMENSINGH PBS-1 | 225,264 | 18,130 | 3,986 | 6,841 | 3,042 | 10 | 173 | 0 | 257,446 | D17KFD |
| | 6,034 | 164 | 92 | 3 | 7 | 1 | 0 | 0 | 6,301 | |
| 18. DINAJPUR PBS-1 | 202,096 | 22,734 | 3,315 | 6,408 | 2,683 | 4 | 151 | 0 | 239,391 | R18KFD |
| | 2,119 | 365 | 9 | 0 | 7 | 0 | 0 | 0 | 2,500 | |
| 19. KUSHTIA PBS | 301,456 | 10,270 | 2,447 | 3,519 | 1,834 | 68 | 251 | 0 | 319,945 | K21KFD |
| | 9,668 | 167 | 17 | 3 | 4 | 0 | 0 | 0 | 9,859 | |
| 20. JOYPURHAT PBS | 156,373 | 6,670 | 2,502 | 2,882 | 1,654 | 59 | 127 | 0 | 172,056 | R22KFD |
| | 1,555 | 39 | 12 | 7 | 6 | 0 | 0 | 0 | 1,619 | |
| 21. PIROJPUR PBS | 194,547 | 19,645 | 3,934 | 6 | 1,464 | 42 | 182 | 0 | 219,820 | R25KFD |
| | 5,847 | 288 | 98 | 0 | 7 | 0 | 0 | 0 | 6,240 | |
| Total for PHASE-1 EXTENSION | 1,777,909 | 145,884 | 27,674 | 31,184 | 17,262 | 314 | 1,397 | 21 | 2,001,665 | |
| | 38,017 | 1,857 | 374 | 25 | 52 | 1 | 0 | 0 | 40,126 | |
| 22. RANGPUR PBS-2 | 183,596 | 10,872 | 2,091 | 6,344 | 1,495 | 67 | 105 | 0 | 204,561 | R23USA |
| | 4,073 | 46 | 4 | 0 | 2 | 0 | 0 | 0 | 4,125 | |
| 23. JAMALPUR PBS | 200,337 | 13,324 | 3,289 | 8,529 | 2,297 | 100 | 147 | 23 | 228,036 | D26USA |
| | 3,946 | 53 | 92 | 3 | 6 | 0 | 0 | 0 | 4,090 | |
| 24. CHITTAGONG PBS-1 | 299,126 | 24,720 | 5,627 | 683 | 2,975 | 132 | 135 | 0 | 332,296 | C33USA |
| | 5,207 | 490 | 52 | 0 | 2 | 2 | 0 | 0 | 5,683 | |
| 25. BOGRA PBS-1 | 191,237 | 8,211 | 2,762 | 3,538 | 2,357 | 68 | 153 | 0 | 208,326 | R29USA |
| | 5,059 | 105 | 25 | 4 | 3 | 0 | 0 | 0 | 5,196 | |
| 26. THANKURGAON PBS | 200,860 | 18,142 | 3,388 | 9,418 | 3,049 | 57 | 36 | 0 | 234,950 | R28FIN |
| | 3,124 | 885 | 29 | 5 | 3 | 0 | 0 | 0 | 4,036 | |
| Total for PHASE-2A | 1,074,156 | 75,269 | 17,147 | 28,512 | 12,164 | 424 | 576 | 23 | 1,208,271 | |
| | 21,409 | 1,469 | 162 | 12 | 16 | 2 | 0 | 0 | 23,070 | |
| 27. MADARIPUR PBS | 184,287 | 11,943 | 2,607 | 156 | 1,004 | 8 | 161 | 0 | 200,246 | D20IDA |
| | 2,669 | 91 | 49 | 0 | 5 | 0 | 0 | 0 | 2,814 | |

PBS CODE : 1st Character Division, Next two Digits SI No according to Energy Division, Next three Characters 1st Denor.

MANAGEMENT INFORMATION SYSTEM (MIS) STATEMENT

For the Month of December, 2016

SERVICES IN PLACE UPTO THIS MONTH

(THIS MONTH ONLY)

| PBS | DOMESTI | COMMERCIA | CHAR INST. | IRRIGATION | GP | LP | ST. LIGHT | SOLAR | TOTAL | PBS CODE |
|---------------------------|-----------------------------|--------------------------|-----------------------|----------------------|----------------------|------------------|--------------------|--------------------|-----------------------------|----------|
| 28. BARISAL PBS-2 | 106,160 2,319 | 15,369 192 | 2,504 34 | 296 0 | 1,131 2 | 2 0 | 215 0 | 69 0 | 105,836 2,507 | B19IDA |
| 29. CHITTAGONG PBS-2 | 222,182 2,431 | 23,263 252 | 3,657 29 | 285 0 | 2,186 5 | 10 3 | 357 1 | 0 0 | 251,940 2,760 | C27IDA |
| 30. MEHERPUR PBS | 281,122 5,216 | 7,170 114 | 3,300 29 | 3,239 24 | 2,062 13 | 35 0 | 265 0 | 0 0 | 297,193 5,393 | K32IDA |
| 31. NQAGHALI PBS | 299,191 8,645 | 30,731 253 | 4,737 47 | 354 1 | 2,412 1 | 91 1 | 119 0 | 0 0 | 337,635 9,158 | C31IDA |
| 32. BAGERHAT PBS | 169,661 3,796 | 14,290 195 | 3,284 18 | 1,692 25 | 1,514 2 | 106 0 | 343 0 | 256 0 | 191,146 4,029 | K24IDA |
| 33. NARSINGDI PBS-1 | 114,303 1,362 | 8,724 36 | 1,106 11 | 328 0 | 5,584 17 | 43 0 | 164 0 | 0 0 | 130,250 1,506 | D30IDA |
| Total for PHASE-2B | 1,436,906 26,660 | 111,490 1,193 | 21,365 213 | 6,348 50 | 15,903 46 | 295 4 | 1,824 1 | 325 0 | 1,594,255 29,166 | |
| 34. KISHOREGANJ PBS | 203,111 5,214 | 17,285 134 | 2,860 39 | 2,381 3 | 1,871 6 | 0 0 | 293 0 | 61 0 | 227,512 5,396 | D34IDA |
| 35. NARSINGDI PBS-2 | 319,830 8,940 | 16,097 112 | 2,388 21 | 2,005 0 | 3,461 1 | 22 0 | 359 0 | 0 0 | 344,162 9,084 | D35IDA |
| 36. NAOGAON PBS-1 | 215,234 2,101 | 11,619 144 | 2,923 35 | 4,118 13 | 2,073 3 | 39 1 | 37 0 | 0 0 | 236,043 2,297 | R38IDA |
| 37. SYLHET PBS-1 | 229,690 3,363 | 28,366 120 | 4,756 15 | 74 2 | 2,416 36 | 0 0 | 309 0 | 0 0 | 265,563 3,535 | S37IDA |
| 38. LAXMIPUR PBS | 197,615 2,684 | 24,715 290 | 3,469 32 | 290 0 | 1,785 8 | 18 1 | 61 0 | 0 0 | 227,973 3,015 | C38IDA |
| 39. BARISAL PBS-1 | 142,114 2,681 | 11,467 185 | 2,483 57 | 33 0 | 812 2 | 0 0 | 139 0 | 2,056 0 | 169,114 3,125 | B39IDA |
| 40. PATUAKHALI PBS | 172,389 2,920 | 23,946 249 | 3,506 96 | 5 -5 | 1,410 2 | 56 0 | 287 0 | 23 0 | 202,022 3,298 | B40IDA |
| Total for PHASE-3A | 1,478,983 28,103 | 133,475 1,220 | 22,637 265 | 8,806 13 | 13,829 57 | 135 2 | 1,475 0 | 2,140 0 | 1,662,779 29,660 | |
| 41. MANIKGONJ PBS | 252,948 2,560 | 23,061 136 | 2,321 27 | 2,989 2 | 1,449 6 | 18 1 | 161 0 | 439 0 | 283,496 2,731 | D41IDA |
| 42. COMILLA PBS-2 | 245,707 3,378 | 15,218 103 | 3,870 12 | 2,332 0 | 2,355 7 | 15 0 | 79 0 | 0 0 | 269,576 3,590 | C43IDA |
| 43. COX'S BAZAR PBS | 153,038 2,796 | 20,184 189 | 3,308 27 | 1,189 0 | 1,476 3 | 73 0 | 145 0 | 2,301 0 | 182,284 3,006 | C42IDA |
| 44. DINAJPUR PBS-2 | 170,226 4,218 | 12,414 241 | 2,852 30 | 2,650 8 | 1,683 4 | 7 0 | 101 0 | 0 0 | 189,733 4,501 | R44IDA |
| 45. NETROKONA PBS | 178,771 3,222 | 17,917 242 | 2,928 36 | 5,762 0 | 2,339 14 | 0 0 | 79 0 | 0 0 | 208,780 3,516 | D45JDR |
| Total for PHASE-4A | 1,002,260 16,174 | 88,614 901 | 19,079 134 | 14,922 10 | 9,296 34 | 113 1 | 565 0 | 2,740 0 | 1,133,779 17,254 | |
| 46. CHAPAI-NAWAB PBS | 173,352 2,564 | 9,246 111 | 3,741 26 | 5,794 10 | 1,362 2 | 18 0 | 65 0 | 4 0 | 193,622 2,712 | R46OPC |
| 47. FARIDPUR PBS | 186,423 3,312 | 12,452 142 | 2,622 62 | 1,223 1 | 1,003 1 | 21 0 | 113 0 | 0 0 | 203,857 3,508 | D47IDB |
| 48. JHENAIDAH PBS | 236,989 4,690 | 9,917 82 | 2,959 29 | 4,648 27 | 1,213 6 | 0 0 | 38 0 | 0 0 | 254,764 4,800 | M82F2 |
| 49. RAJSHAHI PBS | 173,049 3,020 | 7,815 90 | 3,120 28 | 2,584 3 | 979 3 | 40 1 | 146 0 | 0 0 | 187,733 3,145 | R49CF2 |
| 50. KUR-LALMONI PBS | 165,284 3,398 | 17,497 90 | 2,672 20 | 9,545 1 | 1,525 3 | 39 0 | 176 0 | 0 0 | 190,738 3,512 | R50CF2 |
| 51. MAGURA PBS | 135,700 2,378 | 9,459 101 | 2,168 18 | 2,480 0 | 983 10 | 1 0 | 70 0 | 42 0 | 150,903 2,507 | K51OPC |
| 52. BRAHMAN BARIA PBS | 249,516 5,058 | 14,641 162 | 3,217 43 | 1,156 1 | 1,660 7 | 2 0 | 387 1 | 0 0 | 270,679 5,272 | C52KFD |
| 53. MYMENSINGH PBS-2 | 182,918 2,267 | 12,226 79 | 1,833 21 | 1,304 10 | 2,774 4 | 61 2 | 28 0 | 0 0 | 201,144 2,363 | D53KFD |
| Total for PHASE-4C | 1,502,270 26,677 | 93,259 837 | 22,432 232 | 26,734 53 | 11,499 36 | 182 3 | 1,024 1 | 46 0 | 1,659,440 27,839 | |

PBS CODE : 1st Character Division, Next two Digits Si No according to Energization, Next three Characters 1st Diver.

MANAGEMENT INFORMATION SYSTEM (MIS) STATEMENT

For the Month of December, 2016

SERVICES IN PLACE UPTO THIS MONTH

(THIS MONTH ONLY)

| PBS | DOMESTI | COMMERCIA | CHAR INST. | IRRIGATION | GP | LP | ST. LIGHT | SOLAR | TOTAL | PBS CODE |
|-----------------------|-----------|-----------|------------|------------|--------|-------|-----------|-------|-----------|----------|
| 54. NILPHAMARI PBS | 123,745 | 8,319 | 2,128 | 10,277 | 1,201 | 14 | 8 | 0 | 145,690 | R54KFD |
| | 2,218 | 183 | 139 | 0 | 1 | 0 | 0 | 0 | 2,541 | |
| Total for Phase-4D | 123,745 | 8,319 | 2,128 | 10,277 | 1,201 | 14 | 8 | 0 | 145,690 | |
| | 2,218 | 183 | 139 | 0 | 1 | 0 | 0 | 0 | 2,541 | |
| 55. GOPALGONJ PBS | 215,687 | 14,229 | 3,731 | 583 | 1,011 | 32 | 183 | 24 | 238,480 | D55IOB |
| | 5,541 | 408 | 63 | 6 | 2 | 0 | 0 | 0 | 6,020 | |
| 56. BHOLA PBS | 123,409 | 12,957 | 2,348 | 33 | 518 | 4 | 117 | 0 | 139,306 | B56NOR |
| | 2,343 | 126 | 33 | 0 | 3 | 0 | 0 | 0 | 2,504 | |
| 57. RAJBARI PBS | 95,172 | 5,418 | 1,324 | 1,105 | 595 | 0 | 83 | 0 | 105,597 | D57IOB |
| | 1,832 | 43 | 8 | 1 | 1 | 0 | 0 | 0 | 1,885 | |
| 58. SYLHET PBS-2 | 96,929 | 8,757 | 2,031 | 182 | 769 | 254 | 58 | 0 | 108,940 | S58SFD |
| | 1,370 | 10 | 4 | 0 | 1 | 0 | 0 | 0 | 1,385 | |
| 59. SHARIATPUR PBS | 133,130 | 13,264 | 2,206 | 61 | 626 | 2 | 92 | 0 | 149,381 | D59KFD |
| | 2,121 | 120 | 23 | 0 | 1 | 0 | 0 | 0 | 2,265 | |
| 60. MUNSHIGONJ PBS | 200,230 | 19,108 | 3,930 | 53 | 2,519 | 2 | 363 | 0 | 306,204 | D62JBI |
| | 2,510 | 122 | 21 | 0 | 2 | 0 | 0 | 0 | 2,655 | |
| 61. DHAKA PBS-2 | 240,815 | 18,428 | 2,972 | 431 | 2,287 | 256 | 193 | 0 | 365,363 | D63ADB |
| | 3,910 | 37 | 7 | 0 | 9 | 0 | 0 | 0 | 4,023 | |
| 62. SUNAMGONJ PBS | 122,702 | 12,039 | 2,065 | 109 | 927 | 55 | 47 | 2,149 | 140,983 | S62JBI |
| | 1,677 | 119 | 44 | 7 | 3 | 0 | 0 | 0 | 1,850 | |
| Total for PHASE-5A | 1,412,087 | 104,200 | 20,616 | 2,507 | 9,252 | 605 | 1,126 | 2,173 | 1,552,568 | |
| | 21,304 | 1,044 | 203 | 14 | 22 | 0 | 0 | 0 | 22,587 | |
| 63. SHERPUR PBS | 150,678 | 4,579 | 1,305 | 4,044 | 1,188 | 25 | 11 | 9 | 121,840 | D59OPC |
| | 2,529 | 31 | 25 | 0 | 5 | 0 | 0 | 0 | 2,590 | |
| 64. MYMENSINGH PBS-3 | 109,054 | 11,351 | 1,661 | 4,992 | 1,397 | 32 | 43 | 0 | 128,550 | D61 |
| | 3,453 | 133 | 22 | 1 | 5 | 0 | 0 | 0 | 3,614 | |
| 65. GAIBANDHA PBS | 162,965 | 6,999 | 2,130 | 4,811 | 1,023 | 1 | 31 | 0 | 177,780 | R64NOR |
| | 3,479 | 41 | 28 | 0 | 2 | 0 | 0 | 0 | 3,550 | |
| 66. JHALAKATI PBS | 77,058 | 5,808 | 1,778 | 15 | 380 | 0 | 44 | 0 | 85,063 | B65JBI |
| | 1,113 | 29 | 29 | 0 | 1 | 0 | 0 | 0 | 1,202 | |
| 67. KHULNA PBS | 168,880 | 10,764 | 2,485 | 1,240 | 1,342 | 2 | 277 | 0 | 178,990 | K66JBI |
| | 3,536 | 125 | 44 | 0 | 4 | 0 | 0 | 0 | 4,110 | |
| Total for PHASE-5B | 620,655 | 39,501 | 8,379 | 14,902 | 5,330 | 51 | 405 | 9 | 690,243 | |
| | 14,510 | 390 | 148 | 1 | 17 | 0 | 0 | 0 | 15,065 | |
| 68. CHITTAGONG PBS-3 | 134,717 | 12,930 | 1,940 | 43 | 960 | 24 | 67 | 0 | 150,681 | C68 |
| | 2,138 | 141 | 20 | 0 | 1 | 0 | 0 | 0 | 2,300 | |
| 69. GAZIPUR PBS | 367,617 | 25,250 | 2,791 | 742 | 5,965 | 138 | 521 | 0 | 403,024 | D69 |
| | 4,815 | 236 | 31 | 4 | 5 | 5 | 0 | 0 | 5,120 | |
| 70. NARAYANGONJ PBS-1 | 192,185 | 4,902 | 1,577 | 237 | 2,745 | 67 | 112 | 276 | 202,192 | D70 |
| | 1,954 | 49 | 3 | 0 | 3 | 5 | 0 | 0 | 2,015 | |
| 71. DHAKA PBS-3 | 257,049 | 22,684 | 2,200 | 3,101 | 3,029 | 615 | 128 | 0 | 288,806 | D71 |
| | 2,407 | 288 | 27 | 0 | 14 | 3 | 0 | 0 | 2,739 | |
| 72. COMILLA PBS-3 | 230,891 | 14,282 | 3,640 | 104 | 1,263 | 83 | 211 | 0 | 250,474 | C72 |
| | 2,883 | 114 | 28 | 0 | 0 | 0 | 0 | 0 | 3,033 | |
| 73. SIRAJGONJ PBS-2 | 176,040 | 8,910 | 1,765 | 5,910 | 3,193 | 5 | 151 | 1,243 | 196,825 | R73 |
| | 8,182 | 175 | 55 | 0 | 54 | 0 | 0 | 0 | 8,466 | |
| 74. Bogra PBS-2 | 176,596 | 12,764 | 3,207 | 5,519 | 2,458 | 84 | 157 | 0 | 200,745 | R74 |
| | 2,174 | 30 | 14 | 6 | 3 | 1 | 0 | 0 | 2,228 | |
| 75. NAOGAON PBS-2 | 123,052 | 8,315 | 1,249 | 3,374 | 837 | 66 | 69 | 0 | 136,962 | R75IDA |
| | 2,387 | 62 | 26 | 14 | 2 | 0 | 0 | 0 | 2,521 | |
| 76. COMILLA PBS-4 | 130,923 | 10,296 | 2,022 | 2,124 | 1,047 | 6 | 36 | 0 | 145,524 | C76IDA |
| | 3,478 | 94 | 20 | 0 | 0 | 0 | 0 | 0 | 3,592 | |
| 77. CHANDPUR PBS-2 | 201,495 | 16,891 | 3,065 | 6 | 1,428 | 24 | 248 | 0 | 223,157 | C78 |
| | 3,153 | 218 | 27 | 0 | 2 | 3 | 0 | 0 | 3,403 | |
| 78. Narayangonj PBS-2 | 151,798 | 5,805 | 1,712 | 226 | 5,559 | 341 | 111 | 0 | 165,552 | D79 |
| | 2,014 | 71 | 18 | 0 | 6 | 2 | 0 | 0 | 2,111 | |
| Total for PHASE-5C | 2,142,394 | 143,127 | 25,168 | 20,006 | 28,484 | 1,453 | 1,811 | 1,519 | 2,364,942 | |
| | 35,565 | 1,518 | 287 | 24 | 93 | 21 | 0 | 0 | 37,526 | |

PBS CODE : 1st Character Division, Next two Digits SI No according to Energization, Next three Characters 1st Donor.

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**MANAGEMENT INFORMATION SYSTEM (MIS) STATEMENT
For the Month of December, 2016**

SERVICES IN PLACE UPTO THIS MONTH
(THIS MONTH ONLY)

| PBS | DOMESTI | COMMERCIA | CHAR INST. | IRRIGATION | GP | LP | ST. LIGHT | SOLAR | TOTAL | PBS CODE |
|-------------|------------|-----------|------------|------------|---------|-------|-----------|--------|------------|----------|
| Grand Total | 15,600,398 | 1,179,341 | 224,007 | 200,918 | 153,429 | 5,335 | 15,159 | 14,125 | 17,392,712 | |
| | 254,607 | 12,698 | 2,558 | 284 | 497 | 39 | 3 | 0 | 300,676 | |

Source: Management Information System (December 2016) of REB

PBS CODE : 1st Character Division, Next two Digits SI No according to Energization, Next three Characters 1st Donor.

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Table VII.7: Division-wise sales of petroleum products in Bangladesh in 2014-15

| ২০১৭-১৮ সনের বিভাগ ভিত্তিক পেট্রোলিয়াম পণ্যের বিক্রয় | | | | | | | | পরিমাণ: মে.টন |
|--|---------|--------|--------|----------|--------------|---------|----------|------------------|
| বিভাগ | এইচএসডি | এসকেও | এমএস | এইচওবিসি | এফওএইচএ স | জেট এ-১ | অন্যান্য | মোট |
| ঢাকা | ১০৭১৩৫৪ | ৪৪৩৫১ | ৪৪৩৫১ | ১৪১৫১১ | ৩০৮০৮৩ | ৩৩০৮২০ | ১৭০৭০ | ২৪৪৯৬০২ |
| ময়মনসিংহ | ১৪০২৭১ | ১৯০৭ | ১৪০২৭ | ৪৯৮২ | ৩৩০৩ | ০ | ৮৮০ | ১৬৮১৫৮ |
| চট্টগ্রাম | ১১৩৯১২৫ | ৩০৯৮৯ | ২৫০২৪ | ৫০৮৪৩ | ২৮৮৫০১ | ৭১৭০৯ | ৮৫৯৯২ | ১৬৯৮৯০৩ |
| সিলেট | ১০৮০৯৯ | ৩১১০ | ১০৯১৫ | ৪৮৫৩ | ০ | ৪১১৩ | ৪৯২৩ | ২০৩৩১৯ |
| রাজশাহী | ৫৮১১৫৫ | ১৯২২৮ | ৫২০৯৪ | ১০৪৫৫ | ২১৩৫৯০ | ০ | ৪৮৩০ | ৮৮১৩৭৮ |
| রংপুর | ৩২০৪৭৪ | ৮৮৩৩ | ৫১১০৮ | ৯৭৭৮ | ৮০৩৪ | ০ | ১০৫৫ | ৪০০৫৭৫ |
| খুলনা | ৬২৩০১২ | ১২৭০৪ | ৫৪৩৩৩ | ১০৯৮৩ | ৯৯০৮৮ | ১৫৭০ | ১০৭৮০ | ৯১৯১৫৩ |
| বরিশাল | ১৯১০১২ | ৮২০৮ | ২৪১৪৮ | ২৮৫৯ | ০ | ০ | ৭১৮ | ২২০৯৪৫ |
| মোট | ৪৮৩৫৭১২ | ১০৮৪০৩ | ২৮৪০৮৮ | ২৩০২৮০ | ৯২৫১৫০ | ৪০৮২৭২ | ১২৫৮৫১ | ৬৯৪৮৩৫৩ |

<http://www.bpc.gov.bd/site/page/71f21ed6-93a1-4af9-8ce8-6c8a63505efb/>

Total amount of kerosene sold in 2017-18 and 2014-15 were 138403 and 263029 M. ton, respectively. This relationship was used to generate the approximate divisionwise kerosene consumption in 2014-15.

২০১৪-১৫ সনের বিভাগ ভিত্তিক কেরোসিন বিক্রয়

| বিভাগ | এসকেও |
|-----------|--------|
| ঢাকা | ৮৫২৮৩ |
| ময়মনসিংহ | ৩৩২৩ |
| চট্টগ্রাম | ৭০২৭৯ |
| সিলেট | ১১৩০৯ |
| রাজশাহী | ৩৬৫৩৩ |
| রংপুর | ১০৭৮৮ |
| খুলনা | ২৪২৫২ |
| বরিশাল | ১০৫৯৫ |
| মোট | ২৬২৯৬৬ |

Table VII.8: Natural Gas connection in different districts

Titas Gas Transmission & Distribution Company Limited
Statement of Districtwise Domestic Gas Consumer/Connection as on 30-09-2018

| SL no | District Name | Consumer/Connection description | | No of Consumer/ Connection | Gas Use(CM) (September 2018) |
|-------|-------------------------|---------------------------------|-------------------------|-------------------------------|---------------------------------|
| 1 | Dhaka | (a) | Meter: | | |
| | | (i) | Pre-Paid | 13740 | 560111 |
| | | (ii) | Post Paid-Single Burner | 2152 | |
| | | (iii) | Post Paid-Double Burner | | |
| | | (iv) | Post Paid-Bulk Meter | 1015 | |
| | | (b) | Non-Meter: | | |
| | | (i) | Single Burner | 103488 | 8529231 |
| | | (ii) | Double Burner | 1851607 | 162778637 |
| | | | District Total | 1972002 | 171867979 |
| | | 2 | Narayangonj | (a) | Meter: |
| (i) | Pre-Paid | | | | |
| (ii) | Post Paid-Single Burner | | | 106 | |
| (iii) | Post Paid-Double Burner | | | | |
| (iv) | Post Paid-Bulk Meter | | | 35 | |
| (b) | Non-Meter: | | | | |
| (i) | Single Burner | | | 18577 | 1531071 |
| (ii) | Double Burner | | | 227629 | 20011341 |
| | District Total | | | 246347 | 21542412 |
| 3 | Munshigonj | | | (a) | Meter: |
| | | (i) | Pre-Paid | | |
| | | (ii) | Post Paid-Single Burner | 28 | |
| | | (iii) | Post Paid-Double Burner | | |
| | | (iv) | Post Paid-Bulk Meter | 17 | |
| | | (b) | Non-Meter: | | |
| | | (i) | Single Burner | 741 | 61071 |
| | | (ii) | Double Burner | 23173 | 2037187 |
| | | | District Total | 23931 | 2098258 |
| | | 4 | Narsingdi | (a) | Meter: |
| (i) | Pre-Paid | | | | |
| (ii) | Post Paid-Single Burner | | | 150 | |
| (iii) | Post Paid-Double Burner | | | | |
| (iv) | Post Paid-Bulk Meter | | | 26 | |
| (b) | Non-Meter: | | | | |
| (i) | Single Burner | | | 2812 | 231758 |
| (ii) | Double Burner | | | 55957 | 4919297 |
| | District Total | | | 58945 | 5151055 |
| 5 | Manikgonj | | | (a) | Meter: |
| | | (i) | Pre-Paid | | |
| | | (ii) | Post Paid-Single Burner | 20 | |
| | | (iii) | Post Paid-Double Burner | | |
| | | (iv) | Post Paid-Bulk Meter | 21 | |
| | | (b) | Non-Meter: | | |

| | | | | |
|----------------|-------|-------------------------|--------|----------|
| | (i) | Single Burner | 1373 | 113159 |
| | (ii) | Double Burner | 23944 | 2104967 |
| | | District Total | 25362 | 2218126 |
| 6 Gajipur | (a) | Meter: | | |
| | (i) | Pre-Paid | | |
| | (ii) | Post Paid-Single Burner | 151 | |
| | (iii) | Post Paid-Double Burner | | |
| | (iv) | Post Paid-Bulk Meter | 102 | |
| | (b) | Non-Meter: | | |
| | (i) | Single Burner | 7677 | 632720 |
| | (ii) | Double Burner | 261300 | 22971429 |
| | | District Total | 269230 | 23604148 |
| 7 Tangail | (a) | Meter: | | |
| | (i) | Pre-Paid | | |
| | (ii) | Post Paid-Single Burner | 123 | |
| | (iii) | Post Paid-Double Burner | | |
| | (iv) | Post Paid-Bulk Meter | 77 | |
| | (b) | Non-Meter: | | |
| | (i) | Single Burner | 2828 | 233077 |
| | (ii) | Double Burner | 35888 | 3154989 |
| | | District Total | 38916 | 3388066 |
| 8 Mymensingh | (a) | Meter: | | |
| | (i) | Pre-Paid | | |
| | (ii) | Post Paid-Single Burner | 120 | |
| | (iii) | Post Paid-Double Burner | | |
| | (iv) | Post Paid-Bulk Meter | 219 | |
| | (b) | Non-Meter: | | |
| | (i) | Single Burner | 2934 | 241813 |
| | (ii) | Double Burner | 78247 | 6878857 |
| | | District Total | 81520 | 7120670 |
| 9 Jamalpur | (a) | Meter: | | |
| | (i) | Pre-Paid | | |
| | (ii) | Post Paid-Single Burner | 9 | |
| | (iii) | Post Paid-Double Burner | | |
| | (iv) | Post Paid-Bulk Meter | 21 | |
| | (b) | Non-Meter: | | |
| | (i) | Single Burner | 801 | 66016 |
| | (ii) | Double Burner | 12956 | 1138989 |
| | | District Total | 13787 | 1205005 |
| 10 Kishoregonj | (a) | Meter: | | |
| | (i) | Pre-Paid | | |
| | (ii) | Post Paid-Single Burner | 22 | |
| | (iii) | Post Paid-Double Burner | | |
| | (iv) | Post Paid-Bulk Meter | 17 | |
| | (b) | Non-Meter: | | |
| | (i) | Single Burner | 2082 | 171593 |
| | (ii) | Double Burner | 29419 | 2586286 |

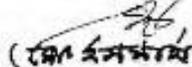
| | | | | | |
|---------------------|-----------|----------------|-------------------------|---------|-----------|
| | | District Total | | 31540 | 2757879 |
| 11 | Sherpur | (a) | Meter: | | |
| | | (i) | Pre-Paid | | |
| | | (ii) | Post Paid-Single Burner | 3 | |
| | | (iii) | Post Paid-Double Burner | | |
| | | (iv) | Post Paid-Bulk Meter | 10 | |
| | | (b) | Non-Meter: | | |
| | | (i) | Single Burner | 309 | 25467 |
| | | (ii) | Double Burner | 6757 | 594022 |
| | | District Total | | 7079 | 619489 |
| 12 | Netrokona | (a) | Meter: | | |
| | | (i) | Pre-Paid | | |
| | | (ii) | Post Paid-Single Burner | 5 | |
| | | (iii) | Post Paid-Double Burner | | |
| | | (iv) | Post Paid-Bulk Meter | 13 | |
| | | (b) | Non-Meter: | | |
| | | (i) | Single Burner | 357 | 29423 |
| | | (ii) | Double Burner | 9180 | 807033 |
| | | District Total | | 9555 | 836456 |
| Company Grand Total | | | | 2778214 | 242409545 |

- * For pre-paid meter customers, gas consumption is considered to the gas sales/ recharges of pre-paid meters in August-2018.
- * For ZMO-Saver, 80% of connection is considered for Dhaka district and 20% of connection is considered for Gazipur district.

Bakhrabad Gas Distribution Company Ltd.

Statement for Districtwise Domestic Gas Consumer/ Connection as on 30.09.2018

| SL No. | Distric Name | Consumer/ Connection Description | No of Consumer/Connection | Gas Use (CM) September 2018 |
|----------------------------|--------------|----------------------------------|---------------------------|-----------------------------|
| 1 | Comilla | (a) Meter : | | |
| | | (i) Pre-Paid | - | - |
| | | (ii) Post Paid | 405 | 239,891.00 |
| | | (iii) Post Paid- Bulk Meter | 3 | 412,371.00 |
| | | (b) Non- Meter: | | |
| | | (i) Single Burner | 5,565 | 458,654.00 |
| | | (ii) Double Burner | 226,917 | 19,948,747.25 |
| | | District Total | 232,890 | 21,059,663.25 |
| 2 | Chandpur | (a) Meter : | | |
| | | (i) Pre-Paid | - | - |
| | | (ii) Post Paid | 112 | 45,975.00 |
| | | (iii) Post Paid- Bulk Meter | - | - |
| | | (b) Non- Meter: | | |
| | | (i) Single Burner | 2,578 | 212,452.98 |
| | | (ii) Double Burner | 54,476 | 4,788,985.16 |
| | | District Total | 57,166 | 5,047,413.14 |
| 3 | Brahmanbaria | (a) Meter : | | |
| | | (i) Pre-Paid | - | - |
| | | (ii) Post Paid | 79 | 186,454.00 |
| | | (iii) Post Paid- Bulk Meter | - | - |
| | | (b) Non- Meter: | | |
| | | (i) Single Burner | 3,345 | 275,686.00 |
| | | (ii) Double Burner | 48,284 | 4,244,747.00 |
| | | District Total | 51,708 | 4,706,887.00 |
| 4 | Noakhali | (a) Meter : | | |
| | | (i) Pre-Paid | - | - |
| | | (ii) Post Paid | 179 | 92,018.00 |
| | | (iii) Post Paid- Bulk Meter | - | - |
| | | (b) Non- Meter: | | |
| | | (i) Single Burner | 2,739 | 225,742.00 |
| | | (ii) Double Burner | 52,339 | 4,601,231.00 |
| | | District Total | 55,257 | 4,918,991.00 |
| 5 | Feni | (a) Meter : | | |
| | | (i) Pre-Paid | - | - |
| | | (ii) Post Paid | 187 | 84,627.00 |
| | | (iii) Post Paid- Bulk Meter | - | - |
| | | (b) Non- Meter: | | |
| | | (i) Single Burner | 2,595 | 213,879.90 |
| | | (ii) Double Burner | 76,338 | 6,710,873.58 |
| | | District Total | 79,120 | 7,009,380.48 |
| 6 | Laxmipur | (a) Meter : | | |
| | | (i) Pre-Paid | - | - |
| | | (ii) Post Paid | 48 | 16,909.69 |
| | | (iii) Post Paid- Bulk Meter | - | - |
| | | (b) Non- Meter: | | |
| | | (i) Single Burner | 258 | 21,264.00 |
| | | (ii) Double Burner | 15,116 | 1,328,879.12 |
| | | District Total | 15,422 | 1,367,052.81 |
| Company Grand Total | | | 491,563 | 44,109,387.68 |


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গ্রাহক সংযোগ

কোম্পানীর বিপণন কার্যক্রমের আওতায় ২০১৬-১৭ অর্থবছরে গ্যাস প্রাপ্তি সাপেক্ষে বাজেটে ১৮টি ক্যাপটিভ পাওয়ার, ৫৫টি শিল্প, ১৩৯টি বাণিজ্যিক, ০১টি চা বাগান, ০৮টি সিএনজি ও ৪০,৮৯৪ টি গৃহস্থালি সংযোগসহ মোট সংযোগের লক্ষ্যমাত্রা নির্ধারণ করা হয়েছিল ৪১,১১৫ টি। সরকারি নিষেধাজ্ঞার কারণে সকল শ্রেণি গ্রাহকের নতুন গ্যাস সংযোগ বন্ধ থাকায় ২০১৬-১৭ অর্থ বছরে কোন গ্যাস সংযোগ প্রদান করা হয়নি। ৩০ জুন ২০১৭ পর্যন্ত বিভিন্ন শ্রেণিভুক্ত গ্রাহক সংযোগের বিবরণ নিচের ছকে প্রদর্শন করা হলো :

৩০ জুন ২০১৭ পর্যন্ত গ্রাহক শ্রেণিভিত্তিক সংযোগ বিবরণী

| গ্রাহক শ্রেণি | সংযোগ সংখ্যা |
|------------------|--------------|
| বিদ্যুৎ | ০৫ |
| সর | ০৪ |
| শিল্প | ১,০৪৮ |
| ক্যাপটিভ পাওয়ার | ১৭৭ |
| বাণিজ্যিক | ২,৭৮৮ |
| মৌসুমি | -- |
| চা-বাগান | ০২ |
| সিএনজি | ৬৮ |
| গৃহস্থালি | ৫,৯৭,৯৮২ |
| মোট | ৬,০২,০৭৪ |

সংযোগ বিচ্ছিন্ন ও পুনঃসংযোগ কার্যক্রম

কোম্পানীর রাজস্ব আদায়ের লক্ষ্যে খেলাপি গ্রাহকদের গ্যাস সংযোগ বিচ্ছিন্ন ও পুনঃসংযোগ প্রদান একটি চলমান প্রক্রিয়া হলেও বিশেষ সংযোগ বিচ্ছিন্নকারী টিম গঠনের মাধ্যমে খেলাপি ও অবৈধভাবে গ্যাস ব্যবহারকারীদের সংযোগ বিচ্ছিন্ন করে উল্লেখযোগ্য পরিমাণ বকেয়া গ্যাস বিল ও জরিমানা আদায় করা হয়েছে। ২০১৬-১৭ অর্থবছরে সংযোগ বিচ্ছিন্ন ও পুনঃসংযোগের বিবরণ নিম্নোক্ত ছকে প্রদর্শন করা হলো :

সংযোগ বিচ্ছিন্ন ও পুনঃসংযোগ বিবরণী

| গ্রাহক শ্রেণি | সংযোগ বিচ্ছিন্ন সংখ্যা | পুনঃসংযোগ | | মন্তব্য |
|---------------|------------------------|-----------|---------------------------|---|
| | | সংখ্যা | আদায়কৃত অর্থ (কোটি টাকা) | |
| শিল্প | ৬৪ | ৪২ | ১৯.৪৭ | |
| বাণিজ্যিক | ১৬৯ | ১৪৭ | ১.৮৭ | |
| সিএনজি | ০৭ | ০৫ | ৪.২০ | |
| গৃহস্থালি | ৯,০১০ | ৭,৬৫৪ | ৮.০০ | আলোচ্য অর্থবছরে অবৈধভাবে গ্যাস ব্যবহারের কারণে বিভিন্ন গ্রাহকের নিকট থেকে অনির্ধারিত গ্যাস বিল বাবদ ৮.২৪ কোটি টাকা এবং জরিমানা বাবদ ০.৬৮ কোটি টাকা আদায় করা হয়। |
| মোট | ৯,২৫০ | ৭,৮৪৮ | ৩৩.৬০ | |

Jalalabad Gas Transmission and Distribution System Ltd

Statement for Districtwise Domestic Gas Consumer/Connction as on 30.09.2018

| SL No | District Name* | Consumer/Connection Description | No of Consumer/Connection | Gas Use (CM) (September 2018) |
|----------------------------|----------------|-------------------------------------|---------------------------|----------------------------------|
| 1 | Sylhet | (a) Meter: | | |
| | | (i) Pre-Paid | | |
| | | (ii) Post Paid-Single Burner | | |
| | | (iii) Post Paid-Double Burner | | |
| | | (IV) Post Paid-Bulk Meter(Consumer) | 785 (Connected) | 604496 |
| | | (b) Non-Meter: | | |
| | | (i) Single-Burner | 8243 | 679386 |
| | | (ii) Double-Burner | 125100 | 10997542 |
| District Total | | | 134128 | |
| 2 | Sunamgonj | (a) Meter: | | |
| | | (i) Pre-Paid | | |
| | | (ii) Post Paid-Single Burner | | |
| | | (iii) Post Paid-Double Burner | | |
| | | (IV) Post Paid-Bulk Meter(Consumer) | 78(Connected) | 169567 |
| | | (b) Non-Meter: | | |
| | | (i) Single-Burner | 1024 | 84398 |
| | | (ii) Double-Burner | 12306 | 1081821 |
| District Total | | | 13408 | |
| 3 | Moulvibazar | (a) Meter: | | |
| | | (i) Pre-Paid | | |
| | | (ii) Post Paid-Single Burner | | |
| | | (iii) Post Paid-Double Burner | | |
| | | (IV) Post Paid-Bulk Meter(Consumer) | 218(Connected) | 162592 |
| | | (b) Non-Meter: | | |
| | | (i) Single-Burner | 2042 | 168302 |
| | | (ii) Double-Burner | 33906 | 2980677 |
| District Total | | | 36166 | |
| 4 | Hobigonj | (a) Meter: | | |
| | | (i) Pre-Paid | | |
| | | (ii) Post Paid-Single Burner | | |
| | | (iii) Post Paid-Double Burner | | |
| | | (IV) Post Paid-Bulk Meter(Consumer) | 144(Connected) | 189658 |
| | | (b) Non-Meter: | | |
| | | (i) Single-Burner | 1199 | 98822 |
| | | (ii) Double-Burner | 24601 | 2162674 |
| District Total | | | 25944 | |
| 5 | Total | (a) Meter: | | |
| | | (i) Pre-Paid | | |
| | | (ii) Post Paid-Single Burner | | |
| | | (iii) Post Paid-Double Burner | | |
| | | (IV) Post Paid-Bulk Meter(Consumer) | 1225(Connected) | 1126313 |
| | | (b) Non-Meter: | | |
| | | (i) Single-Burner | 12508 | 1030909 |
| | | (ii) Double-Burner | 195913 | 17222712 |
| District Total | | | 19379934 | |
| Company Grand Total | | | | |

*Please Insert/ Serve Date for All District in the Franchise Area of the Company

Paschimanchal Gas Company Limited

(A Company of Petrobangla)
Head Office, Nalka, Sirajganj.

Statement Showing The Number of burner quantity

| SL. No | Area Name | 30th June 2018 | 31st October 2018 |
|------------|-----------|----------------------|----------------------|
| | | No. of double Burner | No. of double Burner |
| 1 | Sirajganj | 25074 | 25037 |
| 2 | Pabna | 32822 | 32767 |
| 3 | Rajshahi | 24737 | 24720 |
| 4 | Bogura | 46185 | 45067 |
| GrandTotal | | 128818 | 127591 |

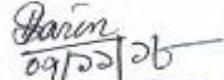

12-11-18
(S.M. Manjur Rahman)
DM(Rev.)


12/11/18
(Mohammed Solayman Gazi)
DGM(Rev.)

Sundarban Gas Company Limited

Statement for Districtwise Domestic Gas Consumer/Connection as on 30.09.2018
(If Available Please Serve Data as on 31.10.2018)

| SL NO | Distric Name | Consumer/Connection Description | No of Cosumer/Connection | Gas Use (CM) | |
|----------------------------|--------------|---|--------------------------|------------------|------------------|
| | | | | September'2018 | October'2018 |
| 1 | Bhola | (a) Meter Connection: | - | - | - |
| | | (i) Pre-Paid | - | - | - |
| | | (ii) Post Paid-Single Burner | 02 | 2219.52 | 2219.52 |
| | | (ii) Post Paid-Double Burner | 02 | 281.78 | 272.66 |
| | | (iv) Post Paid-Bulk Meter | 12 | 11989.30 | 10414.26 |
| | | (b) Non-Meter Connection: (No. of Connection 1218) | - | - | - |
| | | (i) Single-Burner | - | - | - |
| | | (ii) Double-Burner | 3515 | 291428.57 | 309011.00 |
| Company Grand Total | | | - | 305919.17 | 321917.44 |


09/10/2018
(মোঃ নাছির উদ্দিন)
উপ-সহকারী প্রকৌশলী
সুন্দরবন গ্যাস কোম্পানী লিমিটেড
আঞ্চলিক বিপণন কার্যালয়, ভোলা।


09.10.2018
(মোঃ নাছির উদ্দিন)
উপ-সহকারী প্রকৌশলী
সুন্দরবন গ্যাস কোম্পানী লিমিটেড
আঞ্চলিক বিপণন কার্যালয়, ভোলা।

Source: Personal communication (Choudhury & Ahmed 2019)

২০২১-২০২৬ সালের পর্যবেক্ষিত উৎপাদন

| পণ্যের নাম | শ্রেণি | কাঁচ উৎপাদন ক মত | উৎপাদন ল ক্যাম্বা | প ক উৎপাদন | উৎপাদন ল ক্যাম্বা অঙ্ক (%) | উৎপাদন ক মত অঙ্ক (%) |
|------------------|----------------|------------------|-------------------|------------|----------------------------|----------------------|
| চিনি | চিনি | ১১৪৫ | ১১২৫ | ৫১৫৫ | ৪৮ | ২৮ |
| চিনি ড্র | চিনি | ১২২৫ | ৬৫৫৫ | ৩৬৩৯২ | ৫৯ | ৩৫ |
| স্ট্রাটও জাবোয়া | ল ক প ফ ল জ | ১৪ | ৪৭.৫০ | ৪২.০৮ | ৮৯ | ৩ |
| ফলো নল ক | ল ক প ফ ল জ | ২.৩০ | ১৩ | ১১ | ৮৮ | ৫০ |
| কম্পা. পণ * | চিনি | ১১৫ | ১১০ | ১১৫৩ | ১৫ | ৯৯ |

* কট: ৩২ ক মত-১০ ক মত-১০৫৯৯৯ ক মত

২০২১-২০২৬ সালের কাম্বা উৎপাদন

K) চিনি

| চিনির নাম | শ্রেণি | উৎপাদন ক মত (ক) | উৎপাদন ল ক্যাম্বা | | প ক উৎপাদন | | উৎপাদন অঙ্ক (%) | ল ক্যাম্বা অঙ্ক (%) | | উৎপাদন ক মত অঙ্ক (%) | শ্রেণি |
|-----------|--------|-----------------|-------------------|-------|------------|----|-----------------|---------------------|---|----------------------|--------|
| | | | ক | ড | ক | ড | | ক | ড | | |
| পাটক | চিনি | ১১৫ | ৫০০ | ১৫ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| চিনি | চিনি | ১১৫ | ৫৫ | ৩৩৭৫ | ৫৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| চিনি | চিনি | ১১৫ | ৫৫ | ২০০০ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| পাটক | চিনি | ১১৫ | ৫৫ | ২২৮০ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| রংপুর | চিনি | ১১৫ | ৫৫ | ২২৫০ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| চিনি | চিনি | ১১৫ | ৫৫ | ৩৩৭৫ | ৫৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| রংপুর | চিনি | ১১৫ | ৫৫ | ৩৮৫০ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| চিনি | চিনি | ১১৫ | ৫৫ | ৬৫০০ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| চিনি | চিনি | ১১৫ | ৫৫ | ৮৮৮০ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| পাটক | চিনি | ১১৫ | ৫৫ | ৩৪৩৮ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| চিনি | চিনি | ১১৫ | ৫৫ | ৪০০০ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| চিনি | চিনি | ১১৫ | ৫৫ | ৪৮০০ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| চিনি | চিনি | ১১৫ | ৫৫ | ৪২৯০ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| চিনি | চিনি | ১১৫ | ৫৫ | ৪৯৪০ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| চিনি | চিনি | ১১৫ | ৫৫ | ৪৫০০ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |
| চিনি | চিনি | ১১৫ | ৫৫ | ৩০৬৪৮ | ১৫ | ১৫ | ৫ | ৫ | ৫ | ৫ | ৫ |

Source: Annual report of Bangladesh Sugar Industries Corporation 2015-2016

Table VII.10: District-wise LPG Sales Data

| | 2016-17 | M. Ton/month | MT/year |
|-------------------|---------|--------------|---------|
| BARISAL | | | |
| Barguna | | 306 | 3672 |
| Barisal | | 1299 | 15588 |
| Bhola | | 266 | 3432 |
| Jhalakathi | | 374 | 4488 |
| Patuakhali | | 711 | 8532 |
| Perojpur | | 266 | 3432 |
| CHITTAGONG | | | |
| Bandarban | | 204 | 2448 |
| Brahmanbaria | | 1302 | 15624 |
| Chandpur | | 772 | 9264 |
| Chittagong | | 1416 | 17016 |
| Comilla | | 3111 | 37332 |
| Cox's Bazar | | 350 | 4200 |
| Feni | | 406 | 4896 |
| Khagrachari | | 292 | 3504 |
| Lakshimpur | | 406 | 4896 |
| Noakhali | | 613 | 7356 |
| Rangamati | | 313 | 3756 |
| DHAKA | | | |
| Dhaka | | 3692 | 44304 |
| Faridpur | | 613 | 7356 |
| Gazipur | | 1197 | 14364 |
| Gopalganj | | 490 | 5880 |
| Jamalpur | | 190 | 2280 |
| Kishoreganj | | 904 | 10848 |
| Madaripur | | 762 | 9144 |
| Manikganj | | 1020 | 12240 |
| Munsiganj | | 1122 | 13464 |
| Mymensingh | | 636 | 7632 |
| Narayanganj | | 1431 | 17172 |
| Narsingdi | | 1034 | 12408 |
| Netrokona | | 204 | 2448 |
| Rajbari | | 571 | 6852 |
| Shariatpur | | 343 | 4116 |
| Sherpur | | 153 | 1836 |
| Tangail | | 714 | 8568 |
| KHULNA | | | |
| Bagerhat | | 537 | 6444 |
| Chuadanga | | 476 | 5712 |
| Jessore | | 496 | 5952 |
| Jhenaidah | | 626 | 7512 |
| Khulna | | 1639 | 19668 |
| Kushtia | | 354 | 4248 |
| Magura | | 357 | 4284 |
| Meherpur | | 170 | 2040 |
| Narail | | 167 | 2004 |
| Satkhira | | 677 | 8124 |
| RAJSHAHI | | | |
| Bogra | | 326 | 3912 |
| Joypurhat | | 326 | 3912 |
| Natore | | 292 | 3504 |
| Nawabganj | | 326 | 3912 |
| Noagaon | | 490 | 5880 |
| Pabna | | 469 | 5628 |
| Rajshahi | | 751 | 9012 |
| Sirajganj | | 133 | 1596 |
| RANGPUR | | | |
| Dinajpur | | 714 | 8568 |
| Galbandha | | 122 | 1464 |

| | | | |
|---------------|--------------|--------------|---------------|
| | Kurigram | 204 | 2445 |
| | Lalmonirhat | 194 | 2328 |
| | Nilphamari | 571 | 6852 |
| | Panchagar | 102 | 1224 |
| | Rangpur | 527 | 6324 |
| | Thakurgaon | 136 | 1632 |
| SYLHET | | | |
| | Hobigonj | 266 | 3432 |
| | Maulavibazar | 357 | 4284 |
| | Sunamgonj | 245 | 2940 |
| | Sylhet | 473 | 5676 |
| | | 49712 | 488544 |

Source: Personal Communications (Choudhury & Ahmed 2019)

This dataset has been compiled considering all available brands of LPG in Bangladesh.

Table VII.11: Detailed Calculation of Biomass fuel consumption in Rural Household Cooking

| District Name | No of Urban | | No of Rural | | Household using electricity for lighting | Household using Solar pV for lighting | Household using Kerosene for lighting | Amount of Kerosene used for lighting | Total amount of Kerosene used | |
|----------------------------|--------------|------------|-------------|------------|--|---------------------------------------|---------------------------------------|--------------------------------------|-------------------------------|----------|
| | Household | Population | Household | Population | No. | No. | No. | L/yr | L/yr | |
| | | A | B | C | D | E | F | G | | |
| | | | | | | | E = A-C-D ** | | | |
| Barisal Division | | | | | | | | | | |
| 1 | Barguna | 82876 | 342798 | 158675 | 656323 | 109018 | 133595 | 49657 | 451086 | 1356223 |
| 2 | Barisal | 197233 | 892458 | 377624 | 1708703 | 308274 | 151291 | 69350 | 629972 | 3530858 |
| 3 | Bhola | 143113 | 682231 | 274005 | 1306200 | 123409 | 93893 | 150596 | 1368015 | 2699128 |
| 4 | Jhalokati | 60720 | 262122 | 116255 | 501860 | 77058 | 28231 | 39197 | 356065 | 1037042 |
| 5 | Patuakhali | 133030 | 589717 | 254699 | 1129074 | 191844 | 205702 | 62856 | 570982 | 2333115 |
| 6 | Pirojpur | 98296 | 427454 | 188198 | 818404 | 155638 | 77214 | 32561 | 295782 | 1691148 |
| Chittagong Division | | | | | | | | | | |
| 7 | Bandarban | 30757 | 149108 | 58887 | 285482 | | 28127 | 58887 | 534925 | 778712 |
| 8 | Brahmanbaria | 206934 | 1090657 | 396196 | 2088175 | 356126 | 97439 | 40070 | 363999 | 5695931 |
| 9 | Chandpur | 194487 | 927671 | 372366 | 1776121 | 354335 | 151500 | 18031 | 163795 | 4844739 |
| 10 | Chittagong | 857247 | 4261772 | 857247 | 4261772 | 721833 | 109684 | 135414 | 1230100 | 11624867 |
| 11 | Comilla | 404537 | 2068541 | 774527 | 3960433 | 744583 | 153016 | 29944 | 272009 | 10802902 |
| 12 | Cox's Bazar | 159713 | 879281 | 305786 | 1683472 | 153608 | 47697 | 152178 | 1382386 | 4592020 |
| 13 | Feni | 106614 | 551903 | 204124 | 1056675 | 133616 | 12528 | 70508 | 640493 | 2882300 |
| 14 | Khagrachhari | 51372 | 235724 | 98356 | 451317 | | 38342 | 98356 | 893469 | 1231062 |
| 15 | Lakshmipur | 140278 | 663951 | 268577 | 1271202 | 197615 | 123569 | 70962 | 644617 | 3467468 |
| 16 | Noakhali | 228045 | 1193401 | 436615 | 2284889 | 365999 | 121126 | 70616 | 641478 | 6232508 |
| 17 | Rangamati | 49338 | 228836 | 94463 | 438130 | | 39650 | 94463 | 858102 | 1195092 |
| Dhaka Division | | | | | | | | | | |
| 18 | Dhaka | 2026695 | 8761056 | 1091297 | 4717492 | 950805 | 5863 | 140492 | 1276231 | 9646844 |
| 19 | Faridpur | 161333 | 734517 | 308888 | 1406308 | 258652 | 102910 | 50236 | 456347 | 2875772 |

| | | | | | | | | | | |
|--------------------------|-------------|--------|---------|--------|---------|----------|--------|--------|---------|---------|
| 20 | Gazipur | 317333 | 1306990 | 607566 | 2502366 | 367617 | 38511 | 239949 | 2179694 | 5117112 |
| 21 | Gopalganj | 95943 | 450169 | 183692 | 861894 | 162887 | 57497 | 20805 | 188994 | 1762495 |
| 22 | Jamalpur | 216314 | 880311 | 414156 | 1685446 | 200337 | 76609 | 213819 | 1942331 | 3446584 |
| 23 | Kishoreganj | 240871 | 1118076 | 461172 | 2140671 | 203111 | 90424 | 258061 | 2344226 | 4377479 |
| 24 | Madaripur | 96817 | 447687 | 185366 | 857143 | 179870 | 80858 | 5496 | 49926 | 1752779 |
| 25 | Manikganj | 124710 | 534815 | 238770 | 1023958 | 227653 | 54391 | 11117 | 100988 | 2093901 |
| 26 | Munshiganj | 120281 | 555086 | 230290 | 1062768 | 224184 | 14452 | 6106 | 55465 | 2173265 |
| 27 | Mymensingh | 443649 | 1962176 | 849412 | 3756786 | 517236 | 123925 | 332176 | 3017486 | 7682288 |
| 28 | Narayanganj | 259428 | 1132018 | 496702 | 2167364 | 490260 | 1575 | 6442 | 58515 | 4432064 |
| 29 | Narsingdi | 183527 | 854305 | 351381 | 1635654 | 319781.6 | 39336 | 31600 | 287051 | 3344765 |
| 30 | Netrokona | 183976 | 856109 | 352241 | 1639108 | 179771 | 115137 | 172470 | 1566720 | 3351828 |
| 31 | Rajbari | 91443 | 403080 | 175077 | 771738 | 143822 | 25287 | 31255 | 283920 | 1578135 |
| 32 | Shariatpur | 95178 | 443798 | 182227 | 849697 | 177366 | 145825 | 4862 | 44164 | 1737554 |
| 33 | Sherpur | 131103 | 521552 | 251010 | 998564 | 110678 | 38363 | 140332 | 1274774 | 2041974 |
| 34 | Tangail | 334090 | 1384233 | 639650 | 2650255 | 288164 | 81642 | 351486 | 3192901 | 5419533 |
| Khulna Division | | | | | | | | | 0 | 0 |
| 35 | Bagerhat | 136010 | 566770 | 260405 | 1085139 | 189116 | 77564 | 71289 | 647591 | 1850574 |
| 36 | Chuadanga | 106537 | 433504 | 203976 | 829989 | 177869 | 3452 | 26107 | 237155 | 1415446 |
| 37 | Jessore | 252041 | 1061495 | 482558 | 2032340 | 403104 | 17962 | 79454 | 721765 | 3465913 |
| 38 | Jhenaidah | 162162 | 680122 | 310475 | 1302164 | 235988 | 16617 | 74487 | 676638 | 2220684 |
| 39 | Khulna | 210163 | 890238 | 402379 | 1704451 | 160880 | 87450 | 241499 | 2193776 | 2906738 |
| 40 | Kushtia | 183263 | 747522 | 350876 | 1431206 | 301456 | 15821 | 49420 | 448933 | 2440751 |
| 41 | Magura | 79060 | 352643 | 151368 | 675170 | 115345 | 19744 | 36023 | 327230 | 1151422 |
| 42 | Meherpur | 63858 | 251649 | 122263 | 481808 | 103253 | 1198 | 19010 | 172691 | 821665 |
| 43 | Narail | 62436 | 277097 | 119540 | 530530 | 96856 | 19861 | 22683 | 206054 | 904755 |
| 44 | Satkhira | 180422 | 762543 | 345437 | 1459966 | 221787 | 98585 | 123650 | 1123235 | 2489797 |
| Rajshahi Division | | | | | | | | | 0 | 0 |
| 45 | Bogra | 332952 | 1305823 | 637471 | 2500132 | 367793 | 67677 | 269678 | 2449751 | 5451002 |
| 46 | Joypurhat | 93133 | 350857 | 178314 | 671751 | 156373 | 4719 | 21941 | 199308 | 1464609 |
| 47 | Naogaon | 251806 | 998374 | 482108 | 1911490 | 338286 | 65678 | 143822 | 1306481 | 4167594 |
| 48 | Natore | 162754 | 655306 | 311609 | 1254650 | 215228 | 22211 | 96381 | 875527 | 2735496 |

| | | | | | | | | | | |
|-------------------------|------------------|---------|---------|---------|----------|----------|--------|--------|---------|---------|
| 49 | Chapai Nawabganj | 137453 | 632594 | 263168 | 1211165 | 173392 | 4210 | 89776 | 815528 | 2640686 |
| 50 | Pabna | 226828 | 968817 | 434286 | 1854900 | 388691 | 17851 | 45595 | 414181 | 4044212 |
| 51 | Rajshahi | 243342 | 996470 | 465903 | 1907844 | 388277 | 14813 | 77626 | 705158 | 4159644 |
| 52 | Sirajganj | 274525 | 1189334 | 525607 | 2277101 | 393273 | 61704 | 132334 | 1202119 | 4964730 |
| Rangpur Division | | 1465857 | 6061978 | 2806533 | 11606276 | | | | 0 | 0 |
| 53 | Dinajpur | 360463 | 1505828 | 440566 | 1840457 | 372322 | 36834 | 68244 | 619930 | 2159018 |
| 54 | Gaibandha | 308346 | 1198193 | 376867 | 1464458 | 225731 | 51112 | 151136 | 1372917 | 1717938 |
| 55 | Kurigram | 255851 | 1042086 | 312707 | 1273660 | 156080.4 | 76233 | 156627 | 1422799 | 1494116 |
| 56 | Lalmonirhat | 146268 | 632571 | 178771 | 773143 | 82642 | 31099 | 96129 | 873240 | 906965 |
| 57 | Nilphamari | 212304 | 923719 | 259482 | 1128989 | 123745 | 10585 | 135737 | 1233037 | 1324404 |
| 58 | Panchagarh | 115113 | 497377 | 140694 | 607906 | 83433 | 25378 | 57261 | 520157 | 713127 |
| 59 | Rangpur | 362683 | 1450915 | 443279 | 1773340 | 256565 | 21741 | 186713 | 1696104 | 2080285 |
| 60 | Thakurgaon | 161548 | 700025 | 197447 | 855586 | 117427 | 13859 | 80021 | 726907 | 1003678 |
| Sylhet Division | | | | | | | | | 0 | 0 |
| 61 | Habiganj | 151015 | 802107 | 289134 | 1535717 | 220586 | 109516 | 68548 | 622687 | 1984561 |
| 62 | Maulvibazar | 138680 | 736856 | 265517 | 1410787 | 199437 | 112375 | 66080 | 600272 | 1823118 |
| 63 | Sunamganj | 169073 | 947618 | 323707 | 1814312 | 122702 | 226624 | 201005 | 1825933 | 2344581 |
| 64 | Sylhet | 228875 | 1318615 | 438205 | 2524623 | 326629 | 72996 | 111576 | 1013560 | 3262495 |

| Amount of Kerosene used for power gen. | Amount of Kerosene used for cooking | Energy used for cooking from Kerosene | Energy used for cooking from NG | Amount of LPG used for cooking | Energy used for cooking from LPG | Energy used for cooking from electricity | Total energy consumed for cooking | Total biomass energy used for cooking | Total biomass amount used for cooking |
|--|-------------------------------------|---------------------------------------|---------------------------------|--------------------------------|----------------------------------|--|-----------------------------------|---------------------------------------|---------------------------------------|
| L/yr | L/yr | GJ/yr | GJ/yr | MT/yr | GJ/yr | GJ/yr | GJ/yr | TJ/yr | Ton/yr |
| H | I | J | K | L | M | N | O | P | Q |
| | I= G-H-F | J=I*.81*46.1/1000 | | | M=I*47.7 | | | P=O-J-K-M-N | |
| 0 | 905137 | 33798.7 | 0.00 | 661 | 31528 | 0 | 3157632 | 3092 | 230769 |
| 0 | 2900886 | 108322.0 | 0 | 2806 | 133839 | 0 | 7514710 | 7273 | 542728 |
| 0 | 1331113 | 49705.1 | 0 | 618 | 29467 | 0 | 5452701 | 5374 | 401010 |
| 0 | 680977 | 25428.4 | 0 | 808 | 38534 | 0 | 2313473 | 2250 | 167874 |
| 0 | 1762133 | 65799.8 | 0 | 1536 | 73256 | 0 | 5068519 | 4929 | 367870 |
| 0 | 1395366 | 52104.4 | 0 | 618 | 29467 | 0 | 3745147 | 3664 | 273401 |
| | | | | 0 | | | | | 0 |
| 0 | 243787 | 9103.2 | 0 | 441 | 21019 | 0 | 1171841 | 1142 | 85203 |
| 0 | 5331932 | 199099.7 | 0 | 2812 | 134148 | 0 | 7884307 | 7551 | 563512 |
| 0 | 4680944 | 174791.1 | 0 | 1668 | 79541 | 0 | 7410081 | 7156 | 534011 |
| 0 | 10394767 | 388151.0 | 0 | 3063 | 146099 | 0 | 17059213 | 16525 | 1233206 |
| 0 | 10530893 | 393234.1 | 0 | 6720 | 320533 | 0 | 15413090 | 14699 | 1096964 |
| 0 | 3209635 | 119851.0 | 0 | 756 | 36061 | 0 | 6085143 | 5929 | 442480 |
| 0 | 2241807 | 83711.3 | 0 | 881 | 42037 | 0 | 4062063 | 3936 | 293755 |
| 0 | 337592 | 12606.0 | 0 | 631 | 30085 | 0 | 1957292 | 1915 | 142881 |
| 0 | 2822851 | 105408.1 | 0 | 881 | 42037 | 0 | 5344678 | 5197 | 387853 |
| 0 | 5591030 | 208774.6 | 0 | 1756 | 83765 | 0 | 8688644 | 8396 | 626575 |
| 0 | 336989 | 12583.5 | 0 | 676 | 32249 | 0 | 1879815 | 1835 | 136939 |
| | | | | 0 | | | | | 0 |
| 0 | 8370613 | 312567.0 | 0 | 7975 | 380394 | 0 | 21716815 | 21024 | 1568944 |
| 0 | 2419425 | 90343.7 | 0 | 1756 | 83765 | 0 | 6146879 | 5973 | 445729 |

| | | | | | | | | | |
|---|---------|----------|---|------|--------|---|----------|-------|---------|
| 0 | 2937418 | 109686.1 | 0 | 2586 | 123329 | 0 | 12090557 | 11858 | 884891 |
| 0 | 1573501 | 58756.1 | 0 | 1058 | 50486 | 0 | 3655469 | 3546 | 264644 |
| 0 | 1504253 | 56170.3 | 0 | 410 | 19576 | 0 | 8241702 | 8166 | 609400 |
| 0 | 2033253 | 75923.7 | 0 | 1953 | 93141 | 0 | 9177323 | 9008 | 672258 |
| 0 | 1702853 | 63586.2 | 0 | 1689 | 80571 | 0 | 3688780 | 3545 | 264524 |
| 0 | 1992913 | 74417.4 | 0 | 2203 | 105093 | 0 | 4751530 | 4572 | 341196 |
| 0 | 2117801 | 79080.8 | 0 | 2424 | 115602 | 0 | 4582766 | 4388 | 327469 |
| 0 | 4664802 | 174188.4 | 0 | 1806 | 86135 | 0 | 16903296 | 16643 | 1242013 |
| 0 | 4373549 | 163312.7 | 0 | 3091 | 147439 | 0 | 9884360 | 9574 | 714448 |
| 0 | 3057715 | 114178.1 | 0 | 2233 | 106535 | 0 | 6992486 | 6772 | 505356 |
| 0 | 1785107 | 66657.7 | 0 | 441 | 21019 | 0 | 7009602 | 6922 | 516562 |
| 0 | 1294215 | 48327.3 | 0 | 1233 | 58831 | 0 | 3484027 | 3377 | 252005 |
| 0 | 1693390 | 63232.9 | 0 | 741 | 35340 | 0 | 3626327 | 3528 | 263265 |
| 0 | 767200 | 28648.0 | 0 | 330 | 15764 | 0 | 4995095 | 4951 | 369454 |
| 0 | 2226631 | 83144.6 | 0 | 1542 | 73565 | 0 | 12729041 | 12572 | 938234 |
| | | | | 0 | | | | | 0 |
| 0 | 1202983 | 44920.6 | 0 | 1160 | 55328 | 0 | 5182058 | 5082 | 379239 |
| 0 | 1178292 | 43998.6 | 0 | 1028 | 49043 | 0 | 4059122 | 3966 | 295976 |
| 0 | 2744149 | 102469.3 | 0 | 1071 | 51104 | 0 | 9602906 | 9449 | 705174 |
| 0 | 1544046 | 57656.2 | 0 | 1352 | 64498 | 0 | 6178449 | 6056 | 451962 |
| 0 | 712962 | 26622.7 | 0 | 3540 | 168869 | 0 | 8007340 | 7812 | 582974 |
| 0 | 1991819 | 74376.5 | 0 | 765 | 36473 | 0 | 6982435 | 6872 | 512805 |
| 0 | 824193 | 30776.2 | 0 | 771 | 36782 | 0 | 3012216 | 2945 | 219751 |
| 0 | 648974 | 24233.4 | 0 | 367 | 17515 | 0 | 2433039 | 2391 | 178455 |
| 0 | 698702 | 26090.2 | 0 | 404 | 19267 | 0 | 2378837 | 2333 | 174140 |
| 0 | 1366562 | 51028.8 | 0 | 1462 | 69753 | 0 | 6874193 | 6753 | 503986 |
| | | | | 0 | | | | | 0 |
| 0 | 3001251 | 112069.7 | 0 | 704 | 33588 | 0 | 12685664 | 12540 | 935821 |
| 0 | 1265301 | 47247.6 | 0 | 704 | 33588 | 0 | 3548440 | 3468 | 258776 |
| 0 | 2861113 | 106836.8 | 0 | 631 | 30085 | 0 | 9593953 | 9457 | 705749 |
| 0 | 1859970 | 69453.1 | 0 | 704 | 33588 | 0 | 6201022 | 6098 | 455073 |

| | | | | | | | | | |
|---|---------|----------|---|------|-------|---|----------|-------|--------|
| 0 | 1825158 | 68153.2 | 0 | 1058 | 50486 | 0 | 5237050 | 5118 | 381971 |
| 0 | 3630031 | 135549.0 | 0 | 1013 | 48322 | 0 | 8642283 | 8458 | 631225 |
| 0 | 3454486 | 128994.0 | 0 | 1622 | 77377 | 0 | 9271478 | 9065 | 676501 |
| 0 | 3762611 | 140499.7 | 0 | 287 | 13703 | 0 | 10459572 | 10305 | 769057 |
| | | | | 0 | | | | | 0 |
| 0 | 1539088 | 57471.1 | 0 | 1542 | 73565 | 0 | 8767267 | 8636 | 644495 |
| 0 | 345021 | 12883.4 | 0 | 264 | 12570 | 0 | 7499652 | 7474 | 557776 |
| 0 | 71317 | 2663.1 | 0 | 441 | 21019 | 0 | 6222876 | 6199 | 462626 |
| 0 | 33724 | 1259.3 | 0 | 419 | 19988 | 0 | 3557553 | 3536 | 263903 |
| 0 | 91367 | 3411.7 | 0 | 1233 | 58831 | 0 | 5163696 | 5101 | 380705 |
| 0 | 192970 | 7205.7 | 0 | 220 | 10509 | 0 | 2799813 | 2782 | 207619 |
| 0 | 384180 | 14345.7 | 0 | 1138 | 54298 | 0 | 8821247 | 8753 | 653179 |
| 0 | 276771 | 10334.9 | 0 | 294 | 14012 | 0 | 3929202 | 3905 | 291407 |
| | | | | 0 | | | | | 0 |
| 0 | 1361874 | 50853.8 | 0 | 618 | 29467 | 0 | 5753759 | 5673 | 423391 |
| 0 | 1222846 | 45662.3 | 0 | 771 | 36782 | 0 | 5283791 | 5201 | 388160 |
| 0 | 518648 | 19366.8 | 0 | 529 | 25243 | 0 | 6441778 | 6397 | 477401 |
| 0 | 2248935 | 83977.5 | 0 | 1022 | 48734 | 0 | 8720287 | 8588 | 640864 |

Table VII.12: Detailed Calculation of Biomass fuel consumption in Urban Household Cooking

| District Name | | No of Urban | | No of Rural | | Household using | Household | Household using | Amount of |
|----------------------------|--------------|-------------|------------|-------------|------------|-----------------|-----------------|-----------------|---------------|
| | | Household | Population | Household | Population | electricity for | using Solar for | Kerosene for | Kerosene used |
| | | A | B | C | D | E | F | G | H |
| | | | | No. | No. | No. | No. | No. | L/yr |
| Barisal Division | | | | | | | | | |
| 1 | Barguna | 82876 | 342798 | 158675 | 656323 | 70354 | 0 | 12523 | 170407 |
| 2 | Barisal | 197233 | 892458 | 377624 | 1708703 | 167431 | 0 | 29802 | 405545 |
| 3 | Bhola | 143113 | 682231 | 274005 | 1306200 | 121489 | 0 | 21624 | 294265 |
| 4 | Jhalokati | 60720 | 262122 | 116255 | 501860 | 51545 | 0 | 9175 | 124851 |
| 5 | Patuakhali | 133030 | 589717 | 254699 | 1129074 | 112929 | 0 | 20101 | 273532 |
| 6 | Pirojpur | 98296 | 427454 | 188198 | 818404 | 83444 | 0 | 14853 | 202114 |
| Chittagong Division | | | | | | | | | |
| 7 | Bandarban | 30757 | 149108 | 58887 | 285482 | 29274 | 0 | 1482 | 20173 |
| 8 | Brahmanbaria | 206934 | 1090657 | 396196 | 2088175 | 196960 | 0 | 9974 | 135729 |
| 9 | Chandpur | 194487 | 927671 | 372366 | 1776121 | 185113 | 0 | 9374 | 127565 |
| 10 | Chittagong | 857247 | 4261772 | 857247 | 4261772 | 815928 | 0 | 41319 | 562273 |
| 11 | Comilla | 404537 | 2068541 | 774527 | 3960433 | 385038 | 0 | 19499 | 265338 |
| 12 | Cox's Bazar | 159713 | 879281 | 305786 | 1683472 | 152014 | 0 | 7698 | 104756 |
| 13 | Feni | 106614 | 551903 | 204124 | 1056675 | 101475 | 0 | 5139 | 69929 |
| 14 | Khagrachhari | 51372 | 235724 | 98356 | 451317 | 48896 | 0 | 2476 | 33695 |
| 15 | Lakshmipur | 140278 | 663951 | 268577 | 1271202 | 133517 | 0 | 6761 | 92009 |
| 16 | Noakhali | 228045 | 1193401 | 436615 | 2284889 | 217053 | 0 | 10992 | 149576 |
| 17 | Rangamati | 49338 | 228836 | 94463 | 438130 | 46960 | 0 | 2378 | 32361 |
| Dhaka Division | | | | | | | | | |
| 18 | Dhaka | 2026695 | 8761056 | 1091297 | 4717492 | 2009265 | 0 | 17430 | 237182 |
| 19 | Faridpur | 161333 | 734517 | 308888 | 1406308 | 159945 | 0 | 1387 | 18881 |
| 20 | Gazipur | 317333 | 1306990 | 607566 | 2502366 | 314604 | 0 | 2729 | 37137 |

| | | | | | | | | | |
|--------------------------|------------------|--------|---------|--------|---------|--------|---|-------|---------|
| 21 | Gopalganj | 95943 | 450169 | 183692 | 861894 | 95117 | 0 | 825 | 11228 |
| 22 | Jamalpur | 216314 | 880311 | 414156 | 1685446 | 214454 | 0 | 1860 | 25315 |
| 23 | Kishoreganj | 240871 | 1118076 | 461172 | 2140671 | 238799 | 0 | 2071 | 28189 |
| 24 | Madaripur | 96817 | 447687 | 185366 | 857143 | 95984 | 0 | 833 | 11330 |
| 25 | Manikganj | 124710 | 534815 | 238770 | 1023958 | 123638 | 0 | 1073 | 14595 |
| 26 | Munshiganj | 120281 | 555086 | 230290 | 1062768 | 119246 | 0 | 1034 | 14076 |
| 27 | Mymensingh | 443649 | 1962176 | 849412 | 3756786 | 439834 | 0 | 3815 | 51920 |
| 28 | Narayanganj | 259428 | 1132018 | 496702 | 2167364 | 257197 | 0 | 2231 | 30361 |
| 29 | Narsingdi | 183527 | 854305 | 351381 | 1635654 | 181949 | 0 | 1578 | 21478 |
| 30 | Netrokona | 183976 | 856109 | 352241 | 1639108 | 182394 | 0 | 1582 | 21531 |
| 31 | Rajbari | 91443 | 403080 | 175077 | 771738 | 90656 | 0 | 786 | 10701 |
| 32 | Shariatpur | 95178 | 443798 | 182227 | 849697 | 94359 | 0 | 819 | 11139 |
| 33 | Sherpur | 131103 | 521552 | 251010 | 998564 | 129975 | 0 | 1127 | 15343 |
| 34 | Tangail | 334090 | 1384233 | 639650 | 2650255 | 331217 | 0 | 2873 | 39098 |
| Khulna Division | | | | | | | | | |
| 35 | Bagerhat | 136010 | 566770 | 260405 | 1085139 | 117567 | 0 | 18443 | 250972 |
| 36 | Chuadanga | 106537 | 433504 | 203976 | 829989 | 92091 | 0 | 14446 | 196587 |
| 37 | Jessore | 252041 | 1061495 | 482558 | 2032340 | 217864 | 0 | 34177 | 465077 |
| 38 | Jhenaidah | 162162 | 680122 | 310475 | 1302164 | 140172 | 0 | 21989 | 299228 |
| 39 | Khulna | 210163 | 890238 | 402379 | 1704451 | 181665 | 0 | 28498 | 387803 |
| 40 | Kushtia | 183263 | 747522 | 350876 | 1431206 | 158413 | 0 | 24850 | 338166 |
| 41 | Magura | 79060 | 352643 | 151368 | 675170 | 68339 | 0 | 10720 | 145884 |
| 42 | Meherpur | 63858 | 251649 | 122263 | 481808 | 55199 | 0 | 8659 | 117834 |
| 43 | Narail | 62436 | 277097 | 119540 | 530530 | 53969 | 0 | 8466 | 115209 |
| 44 | Satkhira | 180422 | 762543 | 345437 | 1459966 | 155957 | 0 | 24465 | 332923 |
| Rajshahi Division | | | | | | | | | |
| 45 | Bogra | 332952 | 1305823 | 637471 | 2500132 | 259303 | 0 | 73649 | 1002215 |
| 46 | Joypurhat | 93133 | 350857 | 178314 | 671751 | 72532 | 0 | 20601 | 280340 |
| 47 | Naogaon | 251806 | 998374 | 482108 | 1911490 | 196106 | 0 | 55699 | 757958 |
| 48 | Natore | 162754 | 655306 | 311609 | 1254650 | 126753 | 0 | 36001 | 489904 |
| 49 | Chapai Nawabganj | 137453 | 632594 | 263168 | 1211165 | 107049 | 0 | 30405 | 413747 |

| | | | | | | | | | |
|-------------------------|-------------|----------------|----------------|----------------|-----------------|--------|----------|--------|----------|
| 50 | Pabna | 226828 | 968817 | 434286 | 1854900 | 176654 | 0 | 50174 | 682773 |
| 51 | Rajshahi | 243342 | 996470 | 465903 | 1907844 | 189515 | 0 | 53827 | 732482 |
| 52 | Sirajganj | 274525 | 1189334 | 525607 | 2277101 | 213800 | 0 | 60725 | 826346 |
| Rangpur Division | | 1465857 | 6061978 | 2806533 | 11606276 | | 0 | | 0 |
| 53 | Dinajpur | 360463 | 1505828 | 440566 | 1840457 | 255244 | 0 | 105219 | 1431823 |
| 54 | Gaibandha | 308346 | 1198193 | 376867 | 1464458 | 218340 | 0 | 90006 | 1224803 |
| 55 | Kurigram | 255851 | 1042086 | 312707 | 1273660 | 181168 | 0 | 74683 | 1016287 |
| 56 | Lalmonirhat | 146268 | 632571 | 178771 | 773143 | 103572 | 0 | 42696 | 581000 |
| 57 | Nilphamari | 212304 | 923719 | 259482 | 1128989 | 150332 | 0 | 61971 | 843307 |
| 58 | Panchagarh | 115113 | 497377 | 140694 | 607906 | 81512 | 0 | 33602 | 457251 |
| 59 | Rangpur | 362683 | 1450915 | 443279 | 1773340 | 256816 | 0 | 105867 | 1440639 |
| 60 | Thakurgaon | 161548 | 700025 | 197447 | 855586 | 114392 | 0 | 47156 | 641696 |
| Sylhet Division | | 687643 | 3805197 | 1316564 | 7285438 | | 0 | | 0 |
| 61 | Habiganj | 151015 | 802107 | 289134 | 1535717 | 138481 | 0 | 12534 | 170566 |
| 62 | Maulvibazar | 138680 | 736856 | 265517 | 1410787 | 127170 | 0 | 11510 | 156634 |
| 63 | Sunamganj | 169073 | 947618 | 323707 | 1814312 | 155040 | 0 | 14033 | 190962 |
| 64 | Sylhet | 228875 | 1318615 | 438205 | 2524623 | 209879 | 0 | 18997 | 258507 |

| Total amount of Kerosene sold L/yr | Amount of Kerosene used for power gen. L/yr | Amount of Kerosene used for cooking L/yr | Energy used for cooking from Kerosene GJ/yr | Household using NG for cooking No. | Household using other than NG for cooking No. | Total non-NG energy consumed for cooking GJ/yr | Amount of LPG used for cooking MT/yr | Energy used for cooking from LPG GJ/yr |
|---------------------------------------|--|---|--|---------------------------------------|--|---|---|---|
| I | J | K | L | M | N | O | P | Q |
| K=I-J-H | | | N=A-M | | | | | |
| 708358 | 0 | 537950 | 20088 | | 82876 | 1649236 | 2644 | 126111 |
| 1844173 | 0 | 1438628 | 53720 | | 197233 | 3924946 | 11223 | 535354 |
| 1409759 | 0 | 1115494 | 41654 | 3515 | 140653 | 2798991 | 2471 | 117869 |
| 541649 | 0 | 416798 | 15564 | | 60720 | 1208331 | 3231 | 154136 |
| 1218590 | 0 | 945058 | 35289 | | 133030 | 2647296 | 6143 | 293023 |
| 883290 | 0 | 681176 | 25436 | | 98296 | 1956097 | 2471 | 117869 |
| 0 | | | | | | 0 | | |
| 406723 | 0 | 386549 | 14434 | | 30757 | 612055 | 1763 | 84074 |
| 2974995 | 0 | 2839265 | 106021 | 51708 | 170738 | 3397694 | 11249 | 536591 |
| 2530416 | 0 | 2402850 | 89725 | 57166 | 154471 | 3073976 | 6670 | 318163 |
| 11624867 | 0 | 11062594 | 413088 | 597982 | 438659 | 8729323 | 12252 | 584398 |
| 5642374 | 0 | 5377036 | 200784 | 232890 | 241514 | 4806126 | 26879 | 1282130 |
| 2398420 | 0 | 2293664 | 85648 | | 159713 | 3178281 | 3024 | 144245 |
| 1505430 | 0 | 1435501 | 53603 | 79120 | 51230 | 1019481 | 3525 | 168148 |
| 642986 | 0 | 609291 | 22752 | | 51372 | 1022297 | 2523 | 120341 |
| 1811064 | 0 | 1719055 | 64191 | 15422 | 129483 | 2576706 | 3525 | 168148 |
| 3255250 | 0 | 3105674 | 115969 | 55257 | 189365 | 3768364 | 7024 | 335060 |
| 624198 | 0 | 591837 | 22100 | | 49338 | 981831 | 2704 | 128996 |
| 0 | | | | | | 0 | | |
| 17915568 | 0 | 17678386 | 660129 | 1972002 | 646293 | 12861240 | 31899 | 1521577 |
| 1502021 | 0 | 1483140 | 55382 | | 161333 | 3210526 | 7024 | 335060 |
| 2672676 | 0 | 2635539 | 98414 | 215384 | 166564 | 3314619 | 10342 | 493317 |

| | | | | | | | | |
|---------|---|---------|--------|--------|--------|---------|-------|--------|
| 920554 | 0 | 909326 | 33955 | | 95943 | 1909258 | 4234 | 201943 |
| 1800157 | 0 | 1774842 | 66274 | 13787 | 206663 | 4112602 | 1642 | 78304 |
| 2286365 | 0 | 2258176 | 84323 | 31540 | 218793 | 4353979 | 7811 | 372564 |
| 915480 | 0 | 904149 | 33762 | | 96817 | 1926656 | 6756 | 322284 |
| 1093648 | 0 | 1079054 | 40293 | 25362 | 106957 | 2128440 | 8813 | 420371 |
| 1135100 | 0 | 1121024 | 41860 | 23931 | 103529 | 2060228 | 9694 | 462408 |
| 4012472 | 0 | 3960552 | 147891 | 81520 | 386585 | 7693047 | 7223 | 344539 |
| 2314875 | 0 | 2284514 | 85306 | 197078 | 121474 | 2417327 | 12364 | 589755 |
| 1746977 | 0 | 1725499 | 64432 | 58945 | 142266 | 2831084 | 8934 | 426140 |
| 1750665 | 0 | 1729135 | 64568 | 9555 | 177288 | 3528026 | 1763 | 84074 |
| 824262 | 0 | 813561 | 30379 | | 91443 | 1819713 | 4933 | 235325 |
| 907527 | 0 | 896389 | 33472 | | 95178 | 1894037 | 2964 | 141360 |
| 1066527 | 0 | 1051184 | 39252 | 7079 | 126148 | 2510336 | 1322 | 63056 |
| 2830631 | 0 | 2791533 | 104239 | 38916 | 306849 | 6106300 | 6169 | 294259 |
| 0 | | | | | | 0 | | |
| 966558 | 0 | 715587 | 26721 | | 136010 | 2706598 | 4640 | 221313 |
| 739290 | 0 | 542703 | 20265 | | 106537 | 2120087 | 4113 | 196173 |
| 1810253 | 0 | 1345175 | 50230 | | 252041 | 5015614 | 4285 | 204415 |
| 1159867 | 0 | 860640 | 32137 | | 162162 | 3227015 | 5409 | 257992 |
| 1518194 | 0 | 1130392 | 42210 | | 210163 | 4182247 | 14161 | 675478 |
| 1274809 | 0 | 936643 | 34975 | | 183263 | 3646938 | 3059 | 145893 |
| 601390 | 0 | 455506 | 17009 | | 79060 | 1573285 | 3084 | 147130 |
| 429157 | 0 | 311323 | 11625 | | 63858 | 1270781 | 1469 | 70062 |
| 472555 | 0 | 357346 | 13344 | | 62436 | 1242471 | 1616 | 77068 |
| 1300425 | 0 | 967502 | 36128 | | 180422 | 3590403 | 5849 | 279011 |
| 0 | | | | | | 0 | | |
| 2847068 | 0 | 1844853 | 68889 | 45549 | 301068 | 5991247 | 2817 | 134354 |
| 764968 | 0 | 484628 | 18096 | | 93133 | 1853357 | 2817 | 134354 |
| 2176742 | 0 | 1418783 | 52979 | | 251806 | 5010938 | 2523 | 120341 |
| 1428755 | 0 | 938850 | 35058 | | 162754 | 3238805 | 2817 | 134354 |
| 1379235 | 0 | 965488 | 36052 | | 137453 | 2735320 | 4234 | 201943 |

| | | | | | | | | |
|---------|---|---------|-------|--------|--------|---------|------|--------|
| 2112299 | 0 | 1429526 | 53380 | 33165 | 203613 | 4051891 | 4052 | 193288 |
| 2172589 | 0 | 1440108 | 53775 | 24897 | 225914 | 4495694 | 6489 | 309508 |
| 2593087 | 0 | 1766741 | 65972 | 25295 | 256819 | 5110693 | 1149 | 54813 |
| 0 | | | | | | 0 | | |
| 1766469 | 0 | 334646 | 12496 | | 360463 | 7173219 | 6169 | 294259 |
| 1405586 | 0 | 180783 | 6751 | | 308346 | 6136079 | 1054 | 50280 |
| 1222459 | 0 | 206172 | 7699 | | 255851 | 5091444 | 1763 | 84074 |
| 742062 | 0 | 161062 | 6014 | | 146268 | 2910725 | 1676 | 79953 |
| 1083603 | 0 | 240296 | 8973 | | 212304 | 4224842 | 4933 | 235325 |
| 583468 | 0 | 126217 | 4713 | | 115113 | 2290756 | 881 | 42037 |
| 1702051 | 0 | 261412 | 9761 | | 362683 | 7217384 | 4553 | 217191 |
| 821191 | 0 | 179495 | 6703 | | 161548 | 3214801 | 1175 | 56049 |
| 0 | | | | | | 0 | | |
| 1036540 | 0 | 865974 | 32336 | 25944 | 132854 | 2643798 | 2471 | 117869 |
| 952218 | 0 | 795584 | 29708 | 36166 | 113364 | 2255940 | 3084 | 147130 |
| 1224579 | 0 | 1033617 | 38596 | 13408 | 159687 | 3177778 | 2117 | 100971 |
| 1704007 | 0 | 1445500 | 53976 | 134128 | 134986 | 2686218 | 4087 | 194937 |

| Energy used for cooking from electricity GJ/yr R | Total biomass energy used for cooking TJ/yr S | Total biomass amount used for cooking Ton/yr S |
|--|---|--|
| S=O-Q-R-L | | |
| 0 | 1503 | 112167 |
| 0 | 3336 | 248946 |
| 0 | 2639 | 196975 |
| 0 | 1039 | 77510 |
| 0 | 2319 | 173059 |
| 0 | 1813 | 135283 |
| 0 | 514 | 38324 |
| 0 | 2755 | 205603 |
| 0 | 2666 | 198962 |
| 0 | 7732 | 577003 |
| 0 | 3323 | 248001 |
| 0 | 2948 | 220029 |
| 0 | 798 | 59532 |
| 0 | 879 | 65612 |
| 0 | 2344 | 174953 |
| 0 | 3317 | 247562 |
| 0 | 831 | 61995 |
| 0 | 10680 | 796980 |
| 0 | 2820 | 210454 |
| 0 | 2723 | 203201 |

| | | |
|---|------|--------|
| 0 | 1673 | 124878 |
| 0 | 3968 | 296121 |
| 0 | 3897 | 290828 |
| 0 | 1571 | 117210 |
| 0 | 1668 | 124461 |
| 0 | 1556 | 116116 |
| 0 | 7201 | 537359 |
| 0 | 1742 | 130020 |
| 0 | 2341 | 174665 |
| 0 | 3379 | 252193 |
| 0 | 1554 | 115971 |
| 0 | 1719 | 128299 |
| 0 | 2408 | 179704 |
| 0 | 5708 | 425955 |
| 0 | 2459 | 183475 |
| 0 | 1904 | 142063 |
| 0 | 4761 | 355296 |
| 0 | 2937 | 219171 |
| 0 | 3465 | 258549 |
| 0 | 3466 | 258662 |
| 0 | 1409 | 105160 |
| 0 | 1189 | 88738 |
| 0 | 1152 | 85975 |
| 0 | 3275 | 244423 |
| 0 | 5788 | 431941 |
| 0 | 1701 | 126933 |
| 0 | 4838 | 361016 |
| 0 | 3069 | 229059 |
| 0 | 2497 | 186368 |

| | | |
|---|------|--------|
| 0 | 3805 | 283972 |
| 0 | 4132 | 308389 |
| 0 | 4990 | 372381 |
| 0 | 6866 | 512423 |
| 0 | 6079 | 453660 |
| 0 | 5000 | 373110 |
| 0 | 2825 | 210803 |
| 0 | 3981 | 297056 |
| 0 | 2244 | 167463 |
| 0 | 6990 | 521674 |
| 0 | 3152 | 235228 |
| 0 | 2494 | 186089 |
| 0 | 2079 | 155157 |
| 0 | 3038 | 226732 |
| 0 | 2437 | 181888 |

201386

Table VII.13: Detailed Calculation of Biomass fuel consumption in Urban Commercial Units

| District Name | No of Urban | | No of Rural | | No. of hotels | Energy Required | Energy from LPG/NG | |
|----------------------------|--------------|------------|-------------|------------|---------------|-----------------|----------------------|---------|
| | Household | Population | Household | Population | | for cooking | and other nonbiomass | |
| | | | | | | GJ/yr | GJ/yr | |
| | | | | | | D | E | |
| Barisal Division | | | | | | | | |
| 1 | Barguna | 82876 | 342798 | 158675 | 656323 | 1265 | 305103 | 244083 |
| 2 | Barisal | 197233 | 892458 | 377624 | 1708703 | 3293 | 794321 | 635457 |
| 3 | Bhola | 143113 | 682231 | 274005 | 1306200 | 2517 | 607210 | 485768 |
| 4 | Jhalokati | 60720 | 262122 | 116255 | 501860 | 967 | 233299 | 186639 |
| 5 | Patuakhali | 133030 | 589717 | 254699 | 1129074 | 2176 | 524870 | 419896 |
| 6 | Pirojpur | 98296 | 427454 | 188198 | 818404 | 1577 | 380450 | 304360 |
| Chittagong Division | | | | | | 0 | 0 | 0 |
| 7 | Bandarban | 30757 | 149108 | 58887 | 285482 | 550 | 132711 | 106169 |
| 8 | Brahmanbaria | 206934 | 1090657 | 396196 | 2088175 | 4025 | 970725 | 776580 |
| 9 | Chandpur | 194487 | 927671 | 372366 | 1776121 | 3423 | 825662 | 660529 |
| 10 | Chittagong | 857247 | 4261772 | 857247 | 4261772 | 15726 | 3793134 | 3034507 |
| 11 | Comilla | 404537 | 2068541 | 774527 | 3960433 | 7633 | 1841078 | 1472862 |
| 12 | Cox's Bazar | 159713 | 879281 | 305786 | 1683472 | 3245 | 782592 | 626074 |
| 13 | Feni | 106614 | 551903 | 204124 | 1056675 | 2037 | 491214 | 392971 |
| 14 | Khagrachhari | 51372 | 235724 | 98356 | 451317 | 870 | 209803 | 167842 |
| 15 | Lakshmipur | 140278 | 663951 | 268577 | 1271202 | 2450 | 590941 | 472753 |
| 16 | Noakhali | 228045 | 1193401 | 436615 | 2284889 | 4404 | 1062171 | 849737 |
| 17 | Rangamati | 49338 | 228836 | 94463 | 438130 | 844 | 203673 | 162938 |
| Dhaka Division | | | | | | 0 | 0 | 0 |
| 18 | Dhaka | 2026695 | 8761056 | 1091297 | 4717492 | 32329 | 7797663 | 6238130 |
| 19 | Faridpur | 161333 | 734517 | 308888 | 1406308 | 2710 | 653747 | 522998 |
| 20 | Gazipur | 317333 | 1306990 | 607566 | 2502366 | 4823 | 1163269 | 930615 |

| | | | | | | | | |
|--------------------------|------------------|--------|---------|--------|---------|----------|----------|----------|
| 21 | Gopalganj | 95943 | 450169 | 183692 | 861894 | 1661 | 400667 | 320533 |
| 22 | Jamalpur | 216314 | 880311 | 414156 | 1685446 | 3248 | 783509 | 626808 |
| 23 | Kishoreganj | 240871 | 1118076 | 461172 | 2140671 | 4126 | 995129 | 796103 |
| 24 | Madaripur | 96817 | 447687 | 185366 | 857143 | 1652 | 398458 | 318766 |
| 25 | Manikganj | 124710 | 534815 | 238770 | 1023958 | 1973 | 476005 | 380804 |
| 26 | Munshiganj | 120281 | 555086 | 230290 | 1062768 | 2048 | 494047 | 395237 |
| 27 | Mymensingh | 443649 | 1962176 | 849412 | 3756786 | 7241 | 1746409 | 1397127 |
| 28 | Narayanganj | 259428 | 1132018 | 496702 | 2167364 | 4177 | 1007538 | 806030 |
| 29 | Narsingdi | 183527 | 854305 | 351381 | 1635654 | 3152 | 760363 | 608290 |
| 30 | Netrokona | 183976 | 856109 | 352241 | 1639108 | 3159 | 761969 | 609575 |
| 31 | Rajbari | 91443 | 403080 | 175077 | 771738 | 1487 | 358756 | 287005 |
| 32 | Shariatpur | 95178 | 443798 | 182227 | 849697 | 1638 | 394997 | 315997 |
| 33 | Sherpur | 131103 | 521552 | 251010 | 998564 | 1925 | 464200 | 371360 |
| 34 | Tangail | 334090 | 1384233 | 639650 | 2650255 | 5108 | 1232018 | 985615 |
| Khulna Division | | | | | | 0 | 0 | 0 |
| 35 | Bagerhat | 136010 | 566770 | 260405 | 1085139 | 2091 | 504446 | 403557 |
| 36 | Chuadanga | 106537 | 433504 | 203976 | 829989 | 1600 | 385835 | 308668 |
| 37 | Jessore | 252041 | 1061495 | 482558 | 2032340 | 3917 | 944770 | 755816 |
| 38 | Jhenaidah | 162162 | 680122 | 310475 | 1302164 | 2510 | 605334 | 484267 |
| 39 | Khulna | 210163 | 890238 | 402379 | 1704451 | 3285 | 792345 | 633876 |
| 40 | Kushtia | 183263 | 747522 | 350876 | 1431206 | 2758 | 665322 | 532257 |
| 41 | Magura | 79060 | 352643 | 151368 | 675170 | 1301 | 313865 | 251092 |
| 42 | Meherpur | 63858 | 251649 | 122263 | 481808 | 929 | 223977 | 179181 |
| 43 | Narail | 62436 | 277097 | 119540 | 530530 | 1022 | 246626 | 197301 |
| 44 | Satkhira | 180422 | 762543 | 345437 | 1459966 | 2814 | 678691 | 542953 |
| Rajshahi Division | | | | | | 0 | 0 | 0 |
| 45 | Bogra | 332952 | 1305823 | 637471 | 2500132 | 4819 | 1162231 | 929785 |
| 46 | Joypurhat | 93133 | 350857 | 178314 | 671751 | 1295 | 312275 | 249820 |
| 47 | Naogaon | 251806 | 998374 | 482108 | 1911490 | 3684 | 888590 | 710872 |
| 48 | Natore | 162754 | 655306 | 311609 | 1254650 | 2418 | 583247 | 466597 |
| 49 | Chapai Nawabganj | 137453 | 632594 | 263168 | 1211165 | 2334 | 563032 | 450425 |

| | | | | | | | | |
|-------------------------|-------------|---------|---------|---------|----------|-------|---------|---------|
| 50 | Pabna | 226828 | 968817 | 434286 | 1854900 | 3575 | 862283 | 689827 |
| 51 | Rajshahi | 243342 | 996470 | 465903 | 1907844 | 3677 | 886895 | 709516 |
| 52 | Sirajganj | 274525 | 1189334 | 525607 | 2277101 | 4389 | 1058551 | 846841 |
| Rangpur Division | | 1465857 | 6061978 | 2806533 | 11606276 | 22369 | 5395384 | 4316307 |
| 53 | Dinajpur | 360463 | 1505828 | 440566 | 1840457 | 5557 | 1340243 | 1072194 |
| 54 | Gaibandha | 308346 | 1198193 | 376867 | 1464458 | 4421 | 1066436 | 853149 |
| 55 | Kurigram | 255851 | 1042086 | 312707 | 1273660 | 3845 | 927495 | 741996 |
| 56 | Lalmonirhat | 146268 | 632571 | 178771 | 773143 | 2334 | 563012 | 450410 |
| 57 | Nilphamari | 212304 | 923719 | 259482 | 1128989 | 3409 | 822144 | 657715 |
| 58 | Panchagarh | 115113 | 497377 | 140694 | 607906 | 1835 | 442684 | 354147 |
| 59 | Rangpur | 362683 | 1450915 | 443279 | 1773340 | 5354 | 1291368 | 1033094 |
| 60 | Thakurgaon | 161548 | 700025 | 197447 | 855586 | 2583 | 623048 | 498439 |
| Sylhet Division | | 687643 | 3805197 | 1316564 | 7285438 | 14041 | 3386766 | 2709413 |
| 61 | Habiganj | 151015 | 802107 | 289134 | 1535717 | 2960 | 713905 | 571124 |
| 62 | Maulvibazar | 138680 | 736856 | 265517 | 1410787 | 2719 | 655829 | 524664 |
| 63 | Sunamganj | 169073 | 947618 | 323707 | 1814312 | 3497 | 843415 | 674732 |
| 64 | Sylhet | 228875 | 1318615 | 438205 | 2524623 | 4866 | 1173616 | 938893 |

| Energy from Biomass | Amount of Biomass |
|---------------------|-------------------|
| TJ/yr | Ton/yr |
| F | G |
| F=D-E | H=G/Heating Value |
| 61.0 | 4553.8 |
| 158.9 | 11855.5 |
| 121.4 | 9062.8 |
| 46.7 | 3482.1 |
| 105.0 | 7833.9 |
| 76.1 | 5678.4 |
| 0.0 | 0.0 |
| 26.5 | 1980.8 |
| 194.1 | 14488.4 |
| 165.1 | 12323.3 |
| 758.6 | 56613.9 |
| 368.2 | 27478.8 |
| 156.5 | 11680.5 |
| 98.2 | 7331.6 |
| 42.0 | 3131.4 |
| 118.2 | 8820.0 |
| 212.4 | 15853.3 |
| 40.7 | 3039.9 |
| 0.0 | 0.0 |
| 1559.5 | 116383.0 |
| 130.7 | 9757.4 |
| 232.7 | 17362.2 |

| | |
|-------|---------|
| 80.1 | 5980.1 |
| 156.7 | 11694.2 |
| 199.0 | 14852.7 |
| 79.7 | 5947.1 |
| 95.2 | 7104.6 |
| 98.8 | 7373.8 |
| 349.3 | 26065.8 |
| 201.5 | 15037.9 |
| 152.1 | 11348.7 |
| 152.4 | 11372.7 |
| 71.8 | 5354.6 |
| 79.0 | 5895.5 |
| 92.8 | 6928.4 |
| 246.4 | 18388.3 |
| 0.0 | 0.0 |
| 100.9 | 7529.0 |
| 77.2 | 5758.7 |
| 189.0 | 14101.0 |
| 121.1 | 9034.8 |
| 158.5 | 11826.0 |
| 133.1 | 9930.2 |
| 62.8 | 4684.6 |
| 44.8 | 3342.9 |
| 49.3 | 3681.0 |
| 135.7 | 10129.7 |
| 0.0 | 0.0 |
| 232.4 | 17346.7 |
| 62.5 | 4660.8 |
| 177.7 | 13262.5 |
| 116.6 | 8705.2 |
| 112.6 | 8403.5 |

| | |
|--------|---------|
| 172.5 | 12869.9 |
| 177.4 | 13237.2 |
| 211.7 | 15799.3 |
| 1079.1 | 80528.1 |
| 268.0 | 20003.6 |
| 213.3 | 15917.0 |
| 185.5 | 13843.2 |
| 112.6 | 8403.2 |
| 164.4 | 12270.8 |
| 88.5 | 6607.2 |
| 258.3 | 19274.1 |
| 124.6 | 9299.2 |
| 677.4 | 50548.7 |
| 142.8 | 10655.3 |
| 131.2 | 9788.5 |
| 168.7 | 12588.3 |
| 234.7 | 17516.7 |

Table VII.14: Detailed Calculation of Biomass fuel consumption in Rice Parboiling

| | District Name | No of Urban | | No of Rural | | Paddy Produced | Husk Produced | Rice Parboiled | Theoretical Husk required |
|----------------------------|---------------|-------------|------------|-------------|------------|----------------|----------------|----------------|---------------------------|
| | | Household | Population | Household | Population | | | | |
| | | | | A | B | C | D | E | F |
| | | | | | | Ton/year | Ton/year | Ton/year | Ton/year |
| | | | | | | | D= 0.225*C [4] | E= 0.9*C | F=0.170*E [1] |
| Barisal Division | | | | | | | | | |
| 1 | Barguna | 82876 | 342798 | 158675 | 656323 | 406981 | 91570.8 | 366283 | 62268 |
| 2 | Barisal | 197233 | 892458 | 377624 | 1708703 | 736822 | 165785.0 | 663140 | 112734 |
| 3 | Bhola | 143113 | 682231 | 274005 | 1306200 | 1013971 | 228143.6 | 912574 | 155138 |
| 4 | Jhalokati | 60720 | 262122 | 116255 | 501860 | 253389 | 57012.4 | 228050 | 38768 |
| 5 | Patuakhali | 133030 | 589717 | 254699 | 1129074 | 830646 | 186895.3 | 747581 | 127089 |
| 6 | Pirojpur | 98296 | 427454 | 188198 | 818404 | 350757 | 78920.3 | 315681 | 53666 |
| Chittagong Division | | | | | | | | | |
| 7 | Bandarban | 30757 | 149108 | 58887 | 285482 | 128683 | 28953.7 | 115815 | 19689 |
| 8 | Brahmanbaria | 206934 | 1090657 | 396196 | 2088175 | 857604 | 192961.0 | 771844 | 131213 |
| 9 | Chandpur | 194487 | 927671 | 372366 | 1776121 | 503481 | 113283.3 | 453133 | 77033 |
| 10 | Chittagong | 857247 | 4261772 | 857247 | 4261772 | 1118826 | 251735.8 | 1006943 | 171180 |
| 11 | Comilla | 404537 | 2068541 | 774527 | 3960433 | 1637810 | 368507.3 | 1474029 | 250585 |
| 12 | Cox's Bazar | 159713 | 879281 | 305786 | 1683472 | 651156 | 146510.0 | 586040 | 99627 |
| 13 | Feni | 106614 | 551903 | 204124 | 1056675 | 458030 | 103056.8 | 412227 | 70079 |
| 14 | Khagrachhari | 51372 | 235724 | 98356 | 451317 | 183572 | 41303.7 | 165215 | 28086 |
| 15 | Lakshmipur | 140278 | 663951 | 268577 | 1271202 | 549050 | 123536.3 | 494145 | 84005 |
| 16 | Noakhali | 228045 | 1193401 | 436615 | 2284889 | 962566 | 216577.3 | 866309 | 147273 |
| 17 | Rangamati | 49338 | 228836 | 94463 | 438130 | 89334 | 20100.2 | 80401 | 13668 |
| Dhaka Division | | | | | | | | | |
| 18 | Dhaka | 2026695 | 8761056 | 1091297 | 4717492 | 340420 | 76594.4 | 306378 | 52084 |
| 19 | Faridpur | 161333 | 734517 | 308888 | 1406308 | 375934 | 84585.2 | 338341 | 57518 |
| 20 | Gazipur | 317333 | 1306990 | 607566 | 2502366 | 523199 | 117719.7 | 470879 | 80049 |

| | | | | | | | | | |
|--------------------------|------------------|--------|---------|--------|---------|---------|----------|---------|--------|
| 21 | Gopalganj | 95943 | 450169 | 183692 | 861894 | 518233 | 116602.4 | 466410 | 79290 |
| 22 | Jamalpur | 216314 | 880311 | 414156 | 1685446 | 1110723 | 249912.6 | 999650 | 169941 |
| 23 | Kishoreganj | 240871 | 1118076 | 461172 | 2140671 | 1429877 | 321722.4 | 1286889 | 218771 |
| 24 | Madaripur | 96817 | 447687 | 185366 | 857143 | 208359 | 46880.7 | 187523 | 31879 |
| 25 | Manikganj | 124710 | 534815 | 238770 | 1023958 | 342899 | 77152.2 | 308609 | 52463 |
| 26 | Munshiganj | 120281 | 555086 | 230290 | 1062768 | 167059 | 37588.2 | 150353 | 25560 |
| 27 | Mymensingh | 443649 | 1962176 | 849412 | 3756786 | 2592925 | 583408.1 | 2333632 | 396717 |
| 28 | Narayanganj | 259428 | 1132018 | 496702 | 2167364 | 169237 | 38078.4 | 152313 | 25893 |
| 29 | Narsingdi | 183527 | 854305 | 351381 | 1635654 | 416310 | 93669.8 | 374679 | 63695 |
| 30 | Netrokona | 183976 | 856109 | 352241 | 1639108 | 1717641 | 386469.2 | 1545877 | 262799 |
| 31 | Rajbari | 91443 | 403080 | 175077 | 771738 | 253094 | 56946.2 | 227785 | 38723 |
| 32 | Shariatpur | 95178 | 443798 | 182227 | 849697 | 208063 | 46814.1 | 187257 | 31834 |
| 33 | Sherpur | 131103 | 521552 | 251010 | 998564 | 877490 | 197435.3 | 789741 | 134256 |
| 34 | Tangail | 334090 | 1384233 | 639650 | 2650255 | 1292008 | 290701.8 | 1162807 | 197677 |
| Khulna Division | | | | | | 0 | 0.0 | | 0 |
| 35 | Bagerhat | 136010 | 566770 | 260405 | 1085139 | 536636 | 120743.0 | 482972 | 82105 |
| 36 | Chuadanga | 106537 | 433504 | 203976 | 829989 | 438010 | 98552.3 | 394209 | 67016 |
| 37 | Jessore | 252041 | 1061495 | 482558 | 2032340 | 1365104 | 307148.5 | 1228594 | 208861 |
| 38 | Jhenaidah | 162162 | 680122 | 310475 | 1302164 | 1009534 | 227145.2 | 908581 | 154459 |
| 39 | Khulna | 210163 | 890238 | 402379 | 1704451 | 693709 | 156084.4 | 624338 | 106137 |
| 40 | Kushtia | 183263 | 747522 | 350876 | 1431206 | 688353 | 154879.4 | 619518 | 105318 |
| 41 | Magura | 79060 | 352643 | 151368 | 675170 | 419439 | 94373.7 | 377495 | 64174 |
| 42 | Meherpur | 63858 | 251649 | 122263 | 481808 | 263143 | 59207.1 | 236829 | 40261 |
| 43 | Narail | 62436 | 277097 | 119540 | 530530 | 362684 | 81604.0 | 326416 | 55491 |
| 44 | Satkhira | 180422 | 762543 | 345437 | 1459966 | 856931 | 192809.6 | 771238 | 131111 |
| Rajshahi Division | | | | | | 0 | 0.0 | | 0 |
| 45 | Bogra | 332952 | 1305823 | 637471 | 2500132 | 2004740 | 451066.5 | 1804266 | 306725 |
| 46 | Joypurhat | 93133 | 350857 | 178314 | 671751 | 867357 | 195155.4 | 780621 | 132706 |
| 47 | Naogaon | 251806 | 998374 | 482108 | 1911490 | 2352440 | 529299.0 | 2117196 | 359923 |
| 48 | Natore | 162754 | 655306 | 311609 | 1254650 | 737476 | 165932.0 | 663728 | 112834 |
| 49 | Chapai Nawabganj | 137453 | 632594 | 263168 | 1211165 | 692994 | 155923.7 | 623695 | 106028 |

| | | | | | | | | | |
|-------------------------|-------------|---------|---------|---------|----------|---------|----------|---------|--------|
| 50 | Pabna | 226828 | 968817 | 434286 | 1854900 | 721480 | 162333.0 | 649332 | 110386 |
| 51 | Rajshahi | 243342 | 996470 | 465903 | 1907844 | 945031 | 212632.1 | 850528 | 144590 |
| 52 | Sirajganj | 274525 | 1189334 | 525607 | 2277101 | 1150360 | 258831.0 | 1035324 | 176005 |
| Rangpur Division | | 1465857 | 6061978 | 2806533 | 11606276 | 0 | 0.0 | | 0 |
| 53 | Dinajpur | 360463 | 1505828 | 440566 | 1840457 | 2134963 | 480366.6 | 1921466 | 326649 |
| 54 | Gaibandha | 308346 | 1198193 | 376867 | 1464458 | 1127626 | 253715.8 | 1014863 | 172527 |
| 55 | Kurigram | 255851 | 1042086 | 312707 | 1273660 | 956600 | 215235.0 | 860940 | 146360 |
| 56 | Lalmonirhat | 146268 | 632571 | 178771 | 773143 | 670546 | 150872.8 | 603491 | 102593 |
| 57 | Nilphamari | 212304 | 923719 | 259482 | 1128989 | 960326 | 216073.3 | 864293 | 146930 |
| 58 | Panchagarh | 115113 | 497377 | 140694 | 607906 | 612559 | 137825.7 | 551303 | 93722 |
| 59 | Rangpur | 362683 | 1450915 | 443279 | 1773340 | 1521559 | 342350.7 | 1369403 | 232798 |
| 60 | Thakurgaon | 161548 | 700025 | 197447 | 855586 | 947493 | 213185.9 | 852744 | 144966 |
| Sylhet Division | | 687643 | 3805197 | 1316564 | 7285438 | 0 | 0.0 | | 0 |
| 61 | Habiganj | 151015 | 802107 | 289134 | 1535717 | 1112430 | 250296.8 | 1001187 | 170202 |
| 62 | Maulvibazar | 138680 | 736856 | 265517 | 1410787 | 843294 | 189741.2 | 758965 | 129024 |
| 63 | Sunamganj | 169073 | 947618 | 323707 | 1814312 | 1217800 | 274005.0 | 1096020 | 186323 |
| 64 | Sylhet | 228875 | 1318615 | 438205 | 2524623 | 1028491 | 231410.6 | 925642 | 157359 |

| Theoretical energy required | Husk used for parboiling | Energy used from Husk | Energy used from other biomass | other biomass used for parboiling |
|-----------------------------|--------------------------|-----------------------|--------------------------------|-----------------------------------|
| GJ/year | Ton/year | GJ/year | TJ/year | Ton/year |
| G | H | I | J | K |
| $G=12.5 * F$ | $H=0.6 * D$ | $I= 12.5 * H$ | $J=G-I$ | $K=J/15$ |
| 778352 | 54942.5 | 686781 | 92 | 6834 |
| 1409172 | 99471.0 | 1243387 | 166 | 12372 |
| 1939220 | 136886.1 | 1711077 | 228 | 17026 |
| 484606 | 34207.5 | 427593 | 57 | 4255 |
| 1588610 | 112137.2 | 1401715 | 187 | 13947 |
| 670822 | 47352.2 | 591902 | 79 | 5890 |
| 0 | | 0 | 0 | 0 |
| 246107 | 17372.2 | 217153 | 29 | 2161 |
| 1640168 | 115776.6 | 1447207 | 193 | 14400 |
| 962908 | 67970.0 | 849625 | 113 | 8454 |
| 2139754 | 151041.5 | 1888018 | 252 | 18786 |
| 3132312 | 221104.4 | 2763804 | 369 | 27501 |
| 1245335 | 87906.0 | 1098825 | 147 | 10934 |
| 875982 | 61834.1 | 772926 | 103 | 7691 |
| 351081 | 24782.2 | 309777 | 41 | 3082 |
| 1050058 | 74121.8 | 926522 | 124 | 9219 |
| 1840907 | 129946.4 | 1624330 | 217 | 16162 |
| 170852 | 12060.1 | 150752 | 20 | 1500 |
| 0 | | 0 | 0 | 0 |
| 651053 | 45956.7 | 574458 | 77 | 5716 |
| 718974 | 50751.1 | 634389 | 85 | 6312 |
| 1000617 | 70631.8 | 882898 | 118 | 8785 |

| | | | | |
|---------|----------|---------|-----|-------|
| 991120 | 69961.4 | 874518 | 117 | 8702 |
| 2124257 | 149947.5 | 1874344 | 250 | 18650 |
| 2734640 | 193033.4 | 2412918 | 322 | 24009 |
| 398486 | 28128.4 | 351605 | 47 | 3499 |
| 655794 | 46291.3 | 578641 | 77 | 5758 |
| 319500 | 22552.9 | 281911 | 38 | 2805 |
| 4958969 | 350044.8 | 4375561 | 583 | 43538 |
| 323666 | 22847.0 | 285588 | 38 | 2842 |
| 796193 | 56201.9 | 702523 | 94 | 6990 |
| 3284988 | 231881.5 | 2898519 | 386 | 28841 |
| 484043 | 34167.7 | 427097 | 57 | 4250 |
| 397920 | 28088.5 | 351106 | 47 | 3494 |
| 1678200 | 118461.2 | 1480764 | 197 | 14734 |
| 2470965 | 174421.1 | 2180264 | 291 | 21694 |
| 0 | | 0 | 0 | 0 |
| 1026316 | 72445.8 | 905573 | 121 | 9011 |
| 837694 | 59131.4 | 739142 | 99 | 7355 |
| 2610762 | 184289.1 | 2303613 | 307 | 22922 |
| 1930734 | 136287.1 | 1703589 | 227 | 16951 |
| 1326718 | 93650.7 | 1170633 | 156 | 11648 |
| 1316475 | 92927.6 | 1161595 | 155 | 11558 |
| 802176 | 56624.2 | 707803 | 94 | 7043 |
| 503261 | 35524.3 | 444054 | 59 | 4418 |
| 693634 | 48962.4 | 612030 | 82 | 6090 |
| 1638881 | 115685.7 | 1446072 | 193 | 14389 |
| 0 | | 0 | 0 | 0 |
| 3834065 | 270639.9 | 3382999 | 451 | 33662 |
| 1658821 | 117093.2 | 1463665 | 195 | 14564 |
| 4499042 | 317579.4 | 3969743 | 529 | 39500 |
| 1410422 | 99559.2 | 1244490 | 166 | 12383 |
| 1325352 | 93554.2 | 1169428 | 156 | 11636 |

| | | | | |
|---------|----------|---------|-----|-------|
| 1379831 | 97399.8 | 1217498 | 162 | 12114 |
| 1807373 | 127579.2 | 1594741 | 213 | 15868 |
| 2200064 | 155298.6 | 1941233 | 259 | 19316 |
| 0 | | 0 | 0 | 0 |
| 4083116 | 288219.9 | 3602749 | 480 | 35848 |
| 2156584 | 152229.5 | 1902868 | 254 | 18934 |
| 1829498 | 129141.0 | 1614263 | 215 | 16062 |
| 1282419 | 90523.7 | 1131546 | 151 | 11259 |
| 1836623 | 129644.0 | 1620550 | 216 | 16125 |
| 1171519 | 82695.4 | 1033693 | 138 | 10286 |
| 2909981 | 205410.4 | 2567630 | 342 | 25549 |
| 1812080 | 127911.5 | 1598894 | 213 | 15909 |
| 0 | | 0 | 0 | 0 |
| 2127522 | 150178.1 | 1877226 | 250 | 18679 |
| 1612800 | 113844.7 | 1423059 | 190 | 14160 |
| 2329043 | 164403.0 | 2055038 | 274 | 20448 |
| 1966990 | 138846.3 | 1735579 | 231 | 17269 |

Table VII.15: Detailed Calculation of Biomass fuel consumption in Rural Agro processing

| District Name | No of Urban | | No of Rural | | Sugarcane Produced | Sugar Produced | Sugarcane Consumed for sugar production | Energy (bagasse) Consumed for sugar production | | |
|----------------------------|--------------|------------|-------------|------------|--------------------|----------------|---|--|--------|---|
| | Household | Population | Household | Population | Ton/yr | Ton/yr | Ton/yr | GJ/yr | | |
| | | | | | A | B | C | D | E | F |
| F=E*0.32*Heating V | | | | | | | | | | |
| Barisal Division | | | | | | | | | | |
| 1 | Barguna | 82876 | 342798 | 158675 | 656323 | 178 | 0 | 0 | 0 | |
| 2 | Barisal | 197233 | 892458 | 377624 | 1708703 | 10112 | 0 | 0 | 0 | |
| 3 | Bhola | 143113 | 682231 | 274005 | 1306200 | 5134 | 0 | 0 | 0 | |
| 4 | Jhalokati | 60720 | 262122 | 116255 | 501860 | 1350 | 0 | 0 | 0 | |
| 5 | Patuakhali | 133030 | 589717 | 254699 | 1129074 | 134 | 0 | 0 | 0 | |
| 6 | Pirojpur | 98296 | 427454 | 188198 | 818404 | 1789 | 0 | 0 | 0 | |
| Chittagong Division | | | | | | | | | | |
| 7 | Bandarban | 30757 | 149108 | 58887 | 285482 | 868 | 0 | 0 | 0 | |
| 8 | Brahmanbaria | 206934 | 1090657 | 396196 | 2088175 | 71 | 0 | 0 | 0 | |
| 9 | Chandpur | 194487 | 927671 | 372366 | 1776121 | 17141 | 0 | 0 | 0 | |
| 10 | Chittagong | 857247 | 4261772 | 857247 | 4261772 | 13392 | 0 | 0 | 0 | |
| 11 | Comilla | 404537 | 2068541 | 774527 | 3960433 | 5100 | 0 | 0 | 0 | |
| 12 | Cox's Bazar | 159713 | 879281 | 305786 | 1683472 | 1705 | 0 | 0 | 0 | |
| 13 | Feni | 106614 | 551903 | 204124 | 1056675 | 3437 | 0 | 0 | 0 | |
| 14 | Khagrachhari | 51372 | 235724 | 98356 | 451317 | 6294 | 0 | 0 | 0 | |
| 15 | Lakshmipur | 140278 | 663951 | 268577 | 1271202 | 1270 | 0 | 0 | 0 | |
| 16 | Noakhali | 228045 | 1193401 | 436615 | 2284889 | 2055 | 0 | 0 | 0 | |
| 17 | Rangamati | 49338 | 228836 | 94463 | 438130 | 8696 | 0 | 0 | 0 | |
| Dhaka Division | | | | | | | | | | |
| 18 | Dhaka | 2026695 | 8761056 | 1091297 | 4717492 | 2040 | 0 | 0 | 0 | |
| 19 | Faridpur | 161333 | 734517 | 308888 | 1406308 | 164395 | 4560 | 74002 | 267591 | |
| 20 | Gazipur | 317333 | 1306990 | 607566 | 2502366 | 27081 | 0 | 0 | 0 | |

| | | | | | | | | | |
|--------------------------|------------------|--------|---------|--------|---------|---------|-------|--------|--------|
| 21 | Gopalganj | 95943 | 450169 | 183692 | 861894 | 25605 | 0 | 0 | 0 |
| 22 | Jamalpur | 216314 | 880311 | 414156 | 1685446 | 246306 | 4080 | 58570 | 211789 |
| 23 | Kishoreganj | 240871 | 1118076 | 461172 | 2140671 | 1056 | 0 | 0 | 0 |
| 24 | Madaripur | 96817 | 447687 | 185366 | 857143 | 30555 | 0 | 0 | 0 |
| 25 | Manikganj | 124710 | 534815 | 238770 | 1023958 | 26075 | 0 | 0 | 0 |
| 26 | Munshiganj | 120281 | 555086 | 230290 | 1062768 | 2412 | 0 | 0 | 0 |
| 27 | Mymensingh | 443649 | 1962176 | 849412 | 3756786 | 94815 | 0 | 0 | 0 |
| 28 | Narayanganj | 259428 | 1132018 | 496702 | 2167364 | 1063 | 0 | 0 | 0 |
| 29 | Narsingdi | 183527 | 854305 | 351381 | 1635654 | 1596 | 0 | 0 | 0 |
| 30 | Netrokona | 183976 | 856109 | 352241 | 1639108 | 755 | 0 | 0 | 0 |
| 31 | Rajbari | 91443 | 403080 | 175077 | 771738 | 90436 | 0 | 0 | 0 |
| 32 | Shariatpur | 95178 | 443798 | 182227 | 849697 | 14761 | 0 | 0 | 0 |
| 33 | Sherpur | 131103 | 521552 | 251010 | 998564 | 4245 | 0 | 0 | 0 |
| 34 | Tangail | 334090 | 1384233 | 639650 | 2650255 | 65949 | 0 | 0 | 0 |
| Khulna Division | | | | | | | | | |
| 35 | Bagerhat | 136010 | 566770 | 260405 | 1085139 | 27570 | 0 | 0 | 0 |
| 36 | Chuadanga | 106537 | 433504 | 203976 | 829989 | 124529 | 4032 | 71752 | 259455 |
| 37 | Jessore | 252041 | 1061495 | 482558 | 2032340 | 20659 | 0 | 0 | 0 |
| 38 | Jhenaidah | 162162 | 680122 | 310475 | 1302164 | 85960 | 4124 | 70162 | 253706 |
| 39 | Khulna | 210163 | 890238 | 402379 | 1704451 | 3664 | 0 | 0 | 0 |
| 40 | Kushtia | 183263 | 747522 | 350876 | 1431206 | 211270 | 2010 | 39797 | 143906 |
| 41 | Magura | 79060 | 352643 | 151368 | 675170 | 7684 | 0 | 0 | 0 |
| 42 | Meherpur | 63858 | 251649 | 122263 | 481808 | 20353 | 0 | 0 | 0 |
| 43 | Narail | 62436 | 277097 | 119540 | 530530 | 26596 | 0 | 0 | 0 |
| 44 | Satkhira | 180422 | 762543 | 345437 | 1459966 | 6088 | 0 | 0 | 0 |
| Rajshahi Division | | | | | | | | | |
| 45 | Bogra | 332952 | 1305823 | 637471 | 2500132 | 29521 | 0 | 0 | 0 |
| 46 | Joypurhat | 93133 | 350857 | 178314 | 671751 | 51537 | 3043 | 44307 | 160214 |
| 47 | Naogaon | 251806 | 998374 | 482108 | 1911490 | 32537 | 0 | 0 | 0 |
| 48 | Natore | 162754 | 655306 | 311609 | 1254650 | 1284872 | 17680 | 276050 | 998197 |
| 49 | Chapai Nawabganj | 137453 | 632594 | 263168 | 1211165 | 162292 | 0 | 0 | 0 |

| | | | | | | | | | |
|-------------------------|-------------|----------------|----------------|----------------|-----------------|----------------|--------------|---------------|----------------|
| 50 | Pabna | 226828 | 968817 | 434286 | 1854900 | 177415 | 3111 | 52470 | 189732 |
| 51 | Rajshahi | 243342 | 996470 | 465903 | 1907844 | 592325 | 4287 | 70333 | 254324 |
| 52 | Sirajganj | 274525 | 1189334 | 525607 | 2277101 | 51250 | 0 | 0 | 0 |
| Rangpur Division | | 1465857 | 6061978 | 2806533 | 11606276 | | | | 0 |
| 53 | Dinajpur | 360463 | 1505828 | 440566 | 1840457 | 87064 | 2711 | 44449 | 160728 |
| 54 | Gaibandha | 308346 | 1198193 | 376867 | 1464458 | 152052 | 0 | 0 | 0 |
| 55 | Kurigram | 255851 | 1042086 | 312707 | 1273660 | 9099 | 0 | 0 | 0 |
| 56 | Lalmonirhat | 146268 | 632571 | 178771 | 773143 | 3537 | 0 | 0 | 0 |
| 57 | Nilphamari | 212304 | 923719 | 259482 | 1128989 | 4761 | 0 | 0 | 0 |
| 58 | Panchagarh | 115113 | 497377 | 140694 | 607906 | 110017 | 2757 | 48499 | 175372 |
| 59 | Rangpur | 362683 | 1450915 | 443279 | 1773340 | 103516 | 2822 | 54464 | 196942 |
| 60 | Thakurgaon | 161548 | 700025 | 197447 | 855586 | 154073 | 3003 | 59373 | 214693 |
| Sylhet Division | | 687643 | 3805197 | 1316564 | 7285438 | | | | 0 |
| 61 | Habiganj | 151015 | 802107 | 289134 | 1535717 | 8256 | 0 | 0 | 0 |
| 62 | Maulvibazar | 138680 | 736856 | 265517 | 1410787 | 3885 | 0 | 0 | 0 |
| 63 | Sunamganj | 169073 | 947618 | 323707 | 1814312 | 3803 | 0 | 0 | 0 |
| 64 | Sylhet | 228875 | 1318615 | 438205 | 2524623 | 14 | 0 | 0 | 0 |
| | | | | | | 4434070 | 58220 | 964228 | 3486648 |

| Sugarcane Consumed for Ghur production Ton/yr | Energy (bagasse) Consumed for Ghur production GJ/yr | Tea Produced Ton/yr | Thermal Energy Consumed for tea processing GJ/yr | Energy Consumed from nonbiomass sources GJ/yr | Energy Consumed from biomass sources GJ/yr | Total (Sugar, Ghur, Tea) TJ/yr |
|--|--|------------------------|---|--|---|-----------------------------------|
| G | H | I | J | K | L | M |
| G=C-E | H=G*0.32*Heating V | | J=I*43.2 | | L=J-K | M=F+H+L |
| 107 | 386 | 0 | 0 | 0 | 0 | 0 |
| 6067 | 21939 | 0 | 0 | 0 | 0 | 22 |
| 3080 | 11139 | 0 | 0 | 0 | 0 | 11 |
| 810 | 2929 | 0 | 0 | 0 | 0 | 3 |
| 80 | 291 | 0 | 0 | 0 | 0 | 0 |
| 1073 | 3881 | 0 | 0 | 0 | 0 | 4 |
| | 0 | 0 | 0 | 0 | 0 | 0 |
| 521 | 1883 | 0 | 0 | 0 | 0 | 2 |
| 43 | 154 | 0 | 0 | 0 | 0 | 0 |
| 10285 | 37189 | 0 | 0 | 0 | 0 | 37 |
| 8035 | 29055 | 6643 | 286977.6 | 13915 | 273063 | 302 |
| 3060 | 11065 | 0 | 0 | 0 | 0 | 11 |
| 1023 | 3699 | 0 | 0 | 0 | 0 | 4 |
| 2062 | 7457 | 0 | 0 | 0 | 0 | 7 |
| 3776 | 13655 | 0 | 0 | 0 | 0 | 14 |
| 762 | 2755 | 0 | 0 | 0 | 0 | 3 |
| 1233 | 4459 | 0 | 0 | 0 | 0 | 4 |
| 5218 | 18867 | 40 | 1728 | 84 | 1644 | 21 |
| | 0 | | 0 | 0 | 0 | 0 |
| 1224 | 4426 | 0 | 0 | 0 | 0 | 4 |
| 98637 | 356671 | 0 | 0 | 0 | 0 | 624 |
| 16249 | 58755 | 0 | 0 | 0 | 0 | 59 |

| | | | | | | |
|--------|---------|---|---|---|---|------|
| 15363 | 55553 | 0 | 0 | 0 | 0 | 56 |
| 147784 | 534385 | 0 | 0 | 0 | 0 | 746 |
| 634 | 2291 | 0 | 0 | 0 | 0 | 2 |
| 18333 | 66292 | 0 | 0 | 0 | 0 | 66 |
| 15645 | 56572 | 0 | 0 | 0 | 0 | 57 |
| 1447 | 5233 | 0 | 0 | 0 | 0 | 5 |
| 56889 | 205711 | 0 | 0 | 0 | 0 | 206 |
| 638 | 2306 | 0 | 0 | 0 | 0 | 2 |
| 958 | 3463 | 0 | 0 | 0 | 0 | 3 |
| 453 | 1638 | 0 | 0 | 0 | 0 | 2 |
| 54262 | 196210 | 0 | 0 | 0 | 0 | 196 |
| 8857 | 32025 | 0 | 0 | 0 | 0 | 32 |
| 2547 | 9210 | 0 | 0 | 0 | 0 | 9 |
| 39569 | 143083 | 0 | 0 | 0 | 0 | 143 |
| 0 | 0 | | 0 | 0 | 0 | 0 |
| 16542 | 59816 | 0 | 0 | 0 | 0 | 60 |
| 74717 | 270178 | 0 | 0 | 0 | 0 | 530 |
| 12395 | 44822 | 0 | 0 | 0 | 0 | 45 |
| 51576 | 186499 | 0 | 0 | 0 | 0 | 440 |
| 2198 | 7949 | 0 | 0 | 0 | 0 | 8 |
| 126762 | 458371 | 0 | 0 | 0 | 0 | 602 |
| 4610 | 16671 | 0 | 0 | 0 | 0 | 17 |
| 12212 | 44158 | 0 | 0 | 0 | 0 | 44 |
| 15958 | 57703 | 0 | 0 | 0 | 0 | 58 |
| 3653 | 13209 | 0 | 0 | 0 | 0 | 13 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17713 | 64049 | 0 | 0 | 0 | 0 | 64 |
| 30922 | 111815 | 0 | 0 | 0 | 0 | 272 |
| 19522 | 70592 | 0 | 0 | 0 | 0 | 71 |
| 770923 | 2787658 | 0 | 0 | 0 | 0 | 3786 |
| 97375 | 352109 | 0 | 0 | 0 | 0 | 352 |

| | | | | | | |
|----------------|---------|--------------|----------|---------------|------------------|--------------|
| 106449 | 384920 | 0 | 0 | 0 | 0 | 575 |
| 355395 | 1285108 | 0 | 0 | 0 | 0 | 1539 |
| 30750 | 111192 | 0 | 0 | 0 | 0 | 111 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 52238 | 188894 | 0 | 0 | 0 | 0 | 350 |
| 91231 | 329892 | 0 | 0 | 0 | 0 | 330 |
| 5459 | 19741 | 0 | 0 | 0 | 0 | 20 |
| 2122 | 7674 | 0 | 0 | 0 | 0 | 8 |
| 2857 | 10329 | 0 | 0 | 0 | 0 | 10 |
| 66010 | 238693 | 1530 | 66096 | 3205 | 62891 | 477 |
| 62110 | 224588 | 0 | 0 | 0 | 0 | 422 |
| 92444 | 334277 | 0 | 0 | 0 | 0 | 549 |
| 0 | 0 | | 0 | 0 | 0 | 0 |
| 4954 | 17912 | 14977 | 647006.4 | 31372 | 615634 | 634 |
| 2331 | 8429 | 37405 | 1615896 | 78351 | 1537545 | 1546 |
| 2282 | 8251 | 0 | 0 | 0 | 0 | 8 |
| 8 | 30 | 5506 | 237859.2 | 11533 | 226326 | 226 |
| | | 66101 | | 138460 | 2717103.2 | |
| 2660442 | | | | | | 15824 |

Table VII.16: Detailed Calculation of Biomass fuel consumption in Brick Kilns

| | District Name | No of Urban | | No of Rural | | Number of Brick Kiln | Number of Brick Produced | Theoretical Coal required/lakh bricks | Theoretical Coal Required for Brick Making |
|----------------------------|---------------|-------------|------------|-------------|------------|----------------------|--------------------------|---------------------------------------|--|
| | | Household | Population | Household | Population | | | | |
| | | | | A | B | No. C | Unit/yr D | ton/lakh bricks E | ton/yr F |
| F=D*E/100000 | | | | | | | | | |
| Barisal Division | | | | | | | | | |
| 1 | Barguna | 82876 | 342798 | 158675 | 656323 | 43 | 148788927 | 18.65 | 27751 |
| 2 | Barisal | 197233 | 892458 | 377624 | 1708703 | 120 | 415224913 | 19.63 | 81522 |
| 3 | Bhola | 143113 | 682231 | 274005 | 1306200 | 57 | 197231834 | 18.35 | 36194 |
| 4 | Jhalokati | 60720 | 262122 | 116255 | 501860 | 31 | 107266436 | 21.10 | 22630 |
| 5 | Patuakhali | 133030 | 589717 | 254699 | 1129074 | 38 | 131487889 | 19.79 | 26021 |
| 6 | Pirojpur | 98296 | 427454 | 188198 | 818404 | 27 | 93425606 | 19.63 | 18339 |
| Chittagong Division | | | | | | | | | |
| 7 | Bandarban | 30757 | 149108 | 58887 | 285482 | 19 | 65743945 | 22.00 | 14464 |
| 8 | Brahmanbaria | 206934 | 1090657 | 396196 | 2088175 | 152 | 525951557 | 18.89 | 99377 |
| 9 | Chandpur | 194487 | 927671 | 372366 | 1776121 | 146 | 505190311 | 19.62 | 99139 |
| 10 | Chittagong | 857247 | 4261772 | 857247 | 4261772 | 349 | 1207612457 | 21.05 | 254187 |
| 11 | Comilla | 404537 | 2068541 | 774527 | 3960433 | 302 | 1044982699 | 18.09 | 189066 |
| 12 | Cox's Bazar | 159713 | 879281 | 305786 | 1683472 | 67 | 231833910 | 19.31 | 44775 |
| 13 | Feni | 106614 | 551903 | 204124 | 1056675 | 105 | 363321799 | 18.61 | 67612 |
| 14 | Khagrachhari | 51372 | 235724 | 98356 | 451317 | 23 | 79584775 | 22.00 | 17509 |
| 15 | Lakshmipur | 140278 | 663951 | 268577 | 1271202 | 85 | 294117647 | 18.93 | 55672 |
| 16 | Noakhali | 228045 | 1193401 | 436615 | 2284889 | 191 | 660899654 | 18.63 | 123114 |
| 17 | Rangamati | 49338 | 228836 | 94463 | 438130 | 16 | 55363322 | 22.00 | 12180 |
| Dhaka Division | | | | | | | | | |
| 18 | Dhaka | 2026695 | 8761056 | 1091297 | 4717492 | 451 | 1560553633 | 19.72 | 307760 |
| 19 | Faridpur | 161333 | 734517 | 308888 | 1406308 | 107 | 370242215 | 18.22 | 67474 |

| | | | | | | | | | |
|--------------------------|-------------|--------|---------|--------|---------|-----|------------|-------|--------|
| 20 | Gazipur | 317333 | 1306990 | 607566 | 2502366 | 296 | 1024221453 | 20.48 | 209743 |
| 21 | Gopalganj | 95943 | 450169 | 183692 | 861894 | 38 | 131487889 | 20.11 | 26436 |
| 22 | Jamalpur | 216314 | 880311 | 414156 | 1685446 | 63 | 217993080 | 19.90 | 43391 |
| 23 | Kishoreganj | 240871 | 1118076 | 461172 | 2140671 | 119 | 411764706 | 18.75 | 77215 |
| 24 | Madaripur | 96817 | 447687 | 185366 | 857143 | 68 | 235294118 | 18.71 | 44014 |
| 25 | Manikganj | 124710 | 534815 | 238770 | 1023958 | 87 | 301038062 | 18.36 | 55264 |
| 26 | Munshiganj | 120281 | 555086 | 230290 | 1062768 | 84 | 290657439 | 19.71 | 57282 |
| 27 | Mymensingh | 443649 | 1962176 | 849412 | 3756786 | 253 | 875432526 | 19.80 | 173356 |
| 28 | Narayanganj | 259428 | 1132018 | 496702 | 2167364 | 273 | 944636678 | 19.79 | 186923 |
| 29 | Narsingdi | 183527 | 854305 | 351381 | 1635654 | 157 | 543252595 | 18.31 | 99451 |
| 30 | Netrokona | 183976 | 856109 | 352241 | 1639108 | 35 | 121107266 | 18.44 | 22338 |
| 31 | Rajbari | 91443 | 403080 | 175077 | 771738 | 65 | 224913495 | 20.03 | 45050 |
| 32 | Shariatpur | 95178 | 443798 | 182227 | 849697 | 52 | 179930796 | 18.23 | 32803 |
| 33 | Sherpur | 131103 | 521552 | 251010 | 998564 | 20 | 69204152 | 19.00 | 13149 |
| 34 | Tangail | 334090 | 1384233 | 639650 | 2650255 | 179 | 619377163 | 19.47 | 120623 |
| Khulna Division | | | | | | | | | |
| 35 | Bagerhat | 136010 | 566770 | 260405 | 1085139 | 33 | 114186851 | 18.00 | 20554 |
| 36 | Chuadanga | 106537 | 433504 | 203976 | 829989 | 80 | 276816609 | 20.15 | 55779 |
| 37 | Jessore | 252041 | 1061495 | 482558 | 2032340 | 167 | 577854671 | 18.75 | 108374 |
| 38 | Jhenaidah | 162162 | 680122 | 310475 | 1302164 | 92 | 318339100 | 19.70 | 62699 |
| 39 | Khulna | 210163 | 890238 | 402379 | 1704451 | 142 | 491349481 | 18.27 | 89758 |
| 40 | Kushtia | 183263 | 747522 | 350876 | 1431206 | 82 | 283737024 | 20.07 | 56955 |
| 41 | Magura | 79060 | 352643 | 151368 | 675170 | 34 | 117647059 | 18.82 | 22145 |
| 42 | Meherpur | 63858 | 251649 | 122263 | 481808 | 30 | 103806228 | 21.20 | 22007 |
| 43 | Narail | 62436 | 277097 | 119540 | 530530 | 23 | 79584775 | 18.87 | 15017 |
| 44 | Satkhira | 180422 | 762543 | 345437 | 1459966 | 113 | 391003460 | 20.02 | 78270 |
| Rajshahi Division | | | | | | | | | |
| 45 | Bogra | 332952 | 1305823 | 637471 | 2500132 | 204 | 705882353 | 19.86 | 140208 |
| 46 | Joypurhat | 93133 | 350857 | 178314 | 671751 | 34 | 117647059 | 20.17 | 23731 |
| 47 | Naogaon | 251806 | 998374 | 482108 | 1911490 | 142 | 491349481 | 19.77 | 97163 |
| 48 | Natore | 162754 | 655306 | 311609 | 1254650 | 115 | 397923875 | 18.90 | 75225 |

| | | | | | | | | | |
|-------------------------|------------------|----------------|----------------|----------------|-----------------|-------------|--------------------|--------------|-------------------|
| 49 | Chapai Nawabganj | 137453 | 632594 | 263168 | 1211165 | 81 | 280276817 | 21.06 | 59031 |
| 50 | Pabna | 226828 | 968817 | 434286 | 1854900 | 113 | 391003460 | 19.73 | 77163 |
| 51 | Rajshahi | 243342 | 996470 | 465903 | 1907844 | 131 | 453287197 | 19.47 | 88235 |
| 52 | Sirajganj | 274525 | 1189334 | 525607 | 2277101 | 96 | 332179931 | 19.96 | 66298 |
| Rangpur Division | | 1465857 | 6061978 | 2806533 | 11606276 | | | | |
| 53 | Dinajpur | 360463 | 1505828 | 440566 | 1840457 | 132 | 456747405 | 19.02 | 86885 |
| 54 | Gaibandha | 308346 | 1198193 | 376867 | 1464458 | 106 | 366782007 | 19.62 | 71972 |
| 55 | Kurigram | 255851 | 1042086 | 312707 | 1273660 | 68 | 235294118 | 20.00 | 47059 |
| 56 | Lalmonirhat | 146268 | 632571 | 178771 | 773143 | 32 | 110726644 | 19.50 | 21592 |
| 57 | Nilphamari | 212304 | 923719 | 259482 | 1128989 | 51 | 176470588 | 19.73 | 34810 |
| 58 | Panchagarh | 115113 | 497377 | 140694 | 607906 | 22 | 76124567 | 18.35 | 13967 |
| 59 | Rangpur | 362683 | 1450915 | 443279 | 1773340 | 147 | 508650519 | 19.14 | 97351 |
| 60 | Thakurgaon | 161548 | 700025 | 197447 | 855586 | 45 | 155709343 | 20.76 | 32318 |
| Sylhet Division | | 687643 | 3805197 | 1316564 | 7285438 | | | | |
| 61 | Habiganj | 151015 | 802107 | 289134 | 1535717 | 68 | 235294118 | 18.76 | 44152 |
| 62 | Maulvibazar | 138680 | 736856 | 265517 | 1410787 | 49 | 169550173 | 18.90 | 32042 |
| 63 | Sunamganj | 169073 | 947618 | 323707 | 1814312 | 17 | 58823529 | 18.71 | 11003 |
| 64 | Sylhet | 228875 | 1318615 | 438205 | 2524623 | 80 | 276816609 | 18.60 | 51488 |
| | | | | | | 6647 | 23000000000 | 18.73 | 4475071.75 |

| Theoretical Energy Consumed for Brick Making | Coal Energy consumed for Brick Making | Biomass Energy consumed for Brick Making | Biomass consumed for Brick Making |
|--|---------------------------------------|--|-----------------------------------|
| GJ/yr G | GJ/yr H | TJ/yr I | Ton/yr J |
| $G=F*24.4$ | | $I=G-H$ | $J=I/13.4$ |
| 677121 | 555239 | 122 | 9096 |
| 1989149 | 1631102 | 358 | 26720 |
| 883128 | 724165 | 159 | 11863 |
| 552166 | 452776 | 99 | 7417 |
| 634907 | 520623 | 114 | 8529 |
| 447474 | 366929 | 81 | 6011 |
| 0 | | 0 | 0 |
| 352913 | 289389 | 64 | 4741 |
| 2424803 | 1988338 | 436 | 32572 |
| 2418988 | 1983570 | 435 | 32494 |
| 6202159 | 5085771 | 1116 | 83313 |
| 4613204 | 3782827 | 830 | 61968 |
| 1092512 | 895860 | 197 | 14676 |
| 1649744 | 1352790 | 297 | 22161 |
| 427211 | 350313 | 77 | 5739 |
| 1358403 | 1113891 | 245 | 18247 |
| 3003986 | 2463269 | 541 | 40352 |
| 297190 | 243696 | 53 | 3992 |
| 0 | | 0 | 0 |
| 7509338 | 6157657 | 1352 | 100872 |
| 1646367 | 1350021 | 296 | 22115 |

| | | | |
|---------|---------|-----|-------|
| 5117723 | 4196533 | 921 | 68746 |
| 645038 | 528931 | 116 | 8665 |
| 1058740 | 868167 | 191 | 14222 |
| 1884038 | 1544911 | 339 | 25308 |
| 1073938 | 880629 | 193 | 14426 |
| 1348448 | 1105727 | 243 | 18113 |
| 1397690 | 1146106 | 252 | 18775 |
| 4229896 | 3468515 | 761 | 56820 |
| 4560912 | 3739948 | 821 | 61266 |
| 2426615 | 1989824 | 437 | 32596 |
| 545037 | 446930 | 98 | 7321 |
| 1099216 | 901357 | 198 | 14766 |
| 800388 | 656318 | 144 | 10751 |
| 320830 | 263081 | 58 | 4310 |
| 2943197 | 2413422 | 530 | 39535 |
| 0 | | 0 | 0 |
| 501509 | 411237 | 90 | 6737 |
| 1360997 | 1116017 | 245 | 18282 |
| 2644318 | 2168341 | 476 | 35521 |
| 1529855 | 1254481 | 275 | 20550 |
| 2190090 | 1795874 | 394 | 29419 |
| 1389702 | 1139556 | 250 | 18668 |
| 540346 | 443084 | 97 | 7258 |
| 536969 | 440314 | 97 | 7213 |
| 366422 | 300466 | 66 | 4922 |
| 1909785 | 1566024 | 344 | 25654 |
| 0 | | 0 | 0 |
| 3421066 | 2805274 | 616 | 45955 |
| 579039 | 474812 | 104 | 7778 |
| 2370768 | 1944030 | 427 | 31846 |
| 1835488 | 1505100 | 330 | 24656 |

| | | | |
|---------|---------|-----|-------|
| 1440360 | 1181095 | 259 | 19348 |
| 1882768 | 1543870 | 339 | 25291 |
| 2152941 | 1765412 | 388 | 28920 |
| 1617661 | 1326482 | 291 | 21730 |
| 0 | | 0 | 0 |
| 2119995 | 1738396 | 382 | 28478 |
| 1756125 | 1440022 | 316 | 23590 |
| 1148235 | 941553 | 207 | 15424 |
| 526837 | 432007 | 95 | 7077 |
| 849356 | 696472 | 153 | 11409 |
| 340800 | 279456 | 61 | 4578 |
| 2375364 | 1947799 | 428 | 31908 |
| 788567 | 646625 | 142 | 10593 |
| 0 | | 0 | 0 |
| 1077315 | 883398 | 194 | 14471 |
| 781813 | 641087 | 141 | 10502 |
| 268484 | 220157 | 48 | 3607 |
| 1256304 | 1030170 | 226 | 16876 |

Table VII.17a: LPG growth pattern for future projection (Scenario 1)

| | Urban Domestic | | | | Rural Domestic | | | |
|-------------------|----------------|-------|--------|--------|----------------|-------|-------|--------|
| | 2015 | 2020 | 2030 | 2040 | 2015 | 2020 | 2030 | 2040 |
| BARISAL | | | | | | | | |
| Barguna | 2644 | 5318 | 16516 | 35657 | 661 | 1329 | 4129 | 8914 |
| Barisal | 11223 | 22574 | 70112 | 151367 | 2806 | 5644 | 17528 | 37642 |
| Bhola | 2471 | 4970 | 15437 | 33326 | 618 | 1243 | 3859 | 8332 |
| Jhalakathi | 3231 | 6499 | 20186 | 43581 | 808 | 1625 | 5047 | 10885 |
| Patuakhali | 6143 | 12356 | 38375 | 82850 | 1536 | 3089 | 9594 | 20712 |
| Perojpur | 2471 | 4970 | 15437 | 33326 | 618 | 1243 | 3859 | 8332 |
| CHITTAGONG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bandarban | 1763 | 3545 | 11011 | 23771 | 441 | 886 | 2753 | 5943 |
| Brahmanbaria | 11249 | 22626 | 70274 | 151716 | 2812 | 5657 | 17568 | 37929 |
| Chandpur | 6670 | 13416 | 41668 | 89958 | 1668 | 3354 | 10417 | 22489 |
| Chittagong | 12252 | 24642 | 76535 | 165233 | 3063 | 6161 | 19134 | 41308 |
| Comilla | 26879 | 54063 | 167913 | 362511 | 6720 | 13516 | 41978 | 90628 |
| Cox's Bazar | 3024 | 6062 | 18891 | 40784 | 756 | 1521 | 4723 | 10186 |
| Feni | 3525 | 7090 | 22021 | 47542 | 881 | 1773 | 5505 | 11886 |
| Khagrachari | 2523 | 5074 | 15760 | 34025 | 631 | 1269 | 3940 | 8506 |
| Lakshmipur | 3525 | 7090 | 22021 | 47542 | 881 | 1773 | 5505 | 11886 |
| Noakhali | 7024 | 14128 | 43881 | 94735 | 1756 | 3532 | 10970 | 23684 |
| Rangamati | 2704 | 5439 | 16894 | 36472 | 676 | 1360 | 4223 | 9118 |
| DHAKA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dhaka | 31899 | 64160 | 199271 | 430212 | 7975 | 16040 | 49818 | 107553 |
| Faridpur | 7024 | 14128 | 43881 | 94735 | 1756 | 3532 | 10970 | 23684 |
| Gazipur | 10342 | 20602 | 64807 | 139481 | 2586 | 5200 | 16152 | 34870 |
| Gopalganj | 4234 | 8515 | 26447 | 57097 | 1058 | 2129 | 6612 | 14274 |
| Jamalpur | 1642 | 3302 | 10255 | 22140 | 410 | 825 | 2564 | 5535 |
| Kishoreganj | 7811 | 15710 | 48792 | 105339 | 1953 | 3927 | 12198 | 26335 |
| Madaripur | 6756 | 13590 | 42208 | 91123 | 1689 | 3397 | 10552 | 22781 |
| Manikganj | 8813 | 17726 | 55053 | 118856 | 2203 | 4431 | 13763 | 29714 |
| Munsiganj | 9694 | 19498 | 60559 | 130742 | 2424 | 4875 | 15140 | 32685 |
| Mymensingh | 7223 | 14526 | 45122 | 97415 | 1806 | 3632 | 11261 | 24354 |
| Narayanganj | 12364 | 24668 | 77237 | 166748 | 3091 | 6217 | 19309 | 41687 |
| Narsingdi | 8934 | 17969 | 55809 | 120487 | 2233 | 4492 | 13952 | 30122 |
| Netrokona | 1763 | 3545 | 11011 | 23771 | 441 | 886 | 2753 | 5943 |
| Rajbari | 4933 | 9923 | 30819 | 66536 | 1233 | 2461 | 7705 | 16634 |
| Shariatpur | 2964 | 5961 | 18513 | 39968 | 741 | 1490 | 4628 | 9992 |
| Sherpur | 1322 | 2659 | 8258 | 17828 | 330 | 665 | 2064 | 4457 |
| Tangail | 6169 | 12408 | 38537 | 83199 | 1542 | 3102 | 9634 | 20800 |
| KHULNA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bagerhat | 4640 | 9332 | 28984 | 62574 | 1160 | 2333 | 7246 | 15644 |
| Chuadanga | 4113 | 8272 | 25892 | 55466 | 1028 | 2068 | 6423 | 13867 |
| Jessore | 4285 | 8620 | 26771 | 57797 | 1071 | 2155 | 6693 | 14449 |
| Jhenaidah | 5409 | 10879 | 33788 | 72945 | 1352 | 2720 | 8447 | 18236 |
| Khulna | 14161 | 28483 | 88463 | 190985 | 3540 | 7121 | 22116 | 47746 |
| Kushilia | 3059 | 6152 | 19107 | 41250 | 765 | 1538 | 4777 | 10313 |
| Magura | 3084 | 6204 | 19269 | 41600 | 771 | 1551 | 4817 | 10400 |
| Meherpur | 1469 | 2954 | 9176 | 19809 | 367 | 739 | 2294 | 4952 |
| Narail | 1616 | 3250 | 10093 | 21790 | 404 | 812 | 2523 | 5448 |
| Satkhira | 5849 | 11705 | 36540 | 78888 | 1462 | 2941 | 9135 | 19722 |
| RAJSHAHI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bogra | 2817 | 5665 | 17595 | 37987 | 704 | 1416 | 4399 | 9497 |
| Joypurhat | 2817 | 5665 | 17595 | 37987 | 704 | 1416 | 4399 | 9497 |
| Natore | 2523 | 5074 | 15760 | 34025 | 631 | 1269 | 3940 | 8506 |
| Chapainawabganj | 2817 | 5665 | 17595 | 37987 | 704 | 1416 | 4399 | 9497 |
| Noagaon | 4234 | 8515 | 26447 | 57097 | 1058 | 2129 | 6612 | 14274 |
| Pabna | 4052 | 8100 | 25314 | 54650 | 1013 | 2038 | 6328 | 13683 |
| Rajshahi | 6489 | 13051 | 40534 | 87511 | 1622 | 3263 | 10134 | 21878 |
| Sirajganj | 1149 | 2311 | 7179 | 15498 | 287 | 578 | 1795 | 3874 |
| RANGPUR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dinajpur | 6169 | 12408 | 38537 | 83199 | 1542 | 3102 | 9634 | 20800 |
| Galbandha | 1054 | 2120 | 6585 | 14216 | 264 | 530 | 1646 | 3554 |
| Kurigram | 1763 | 3545 | 11011 | 23771 | 441 | 886 | 2753 | 5943 |
| Lalmonirhat | 1676 | 3371 | 10471 | 22806 | 419 | 843 | 2618 | 5651 |
| Nilphamari | 4933 | 9923 | 30819 | 66536 | 1233 | 2461 | 7705 | 16634 |

| | | | | | | | | | |
|---------------|--------------|---------------|---------------|----------------|----------------|--------------|---------------|---------------|----------------|
| | Panchagar | 881 | 1773 | 5505 | 11886 | 220 | 443 | 1376 | 2971 |
| | Rangpur | 4533 | 9156 | 28444 | 61409 | 1138 | 2290 | 7111 | 15352 |
| | Thakurgaon | 1175 | 2363 | 7340 | 15847 | 294 | 591 | 1835 | 3962 |
| SYLHET | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Hobigonj | 2471 | 4970 | 15437 | 33326 | 618 | 1243 | 3859 | 8332 |
| | Maulavibazar | 3084 | 6204 | 19269 | 41600 | 771 | 1551 | 4817 | 10400 |
| | Sunamgonj | 2117 | 4255 | 13224 | 28549 | 529 | 1064 | 3306 | 7137 |
| | Sylhet | 4087 | 8220 | 25530 | 55117 | 1022 | 2055 | 6362 | 13779 |
| | | 351752 | 707498 | 2197382 | 4743983 | 87938 | 176875 | 549346 | 1185996 |

Source: Personal Communications (Choudhury & Ahmed 2019)

This dataset has been compiled considering all available brands of LPG in Bangladesh.
Assuming 90% urban/rural consumption is domestic

Table VII.17b: LPG growth pattern for future projection (Scenario 2)

| | Urban Domestic | | | | Rural Domestic | | | |
|-------------------|----------------|-------|--------|--------|----------------|-------|-------|--------|
| | 2015 | 2020 | 2030 | 2040 | 2015 | 2020 | 2030 | 2040 |
| BARISAL | | | | | | | | |
| Barguna | 2644 | 6579 | 26615 | 69031 | 661 | 1645 | 6654 | 17256 |
| Barisal | 11223 | 27927 | 112962 | 293045 | 2806 | 6962 | 26245 | 73261 |
| Bhola | 2471 | 6149 | 24675 | 64520 | 618 | 1537 | 6219 | 16130 |
| Jhalakathi | 3231 | 8041 | 32529 | 84372 | 808 | 2010 | 8132 | 21093 |
| Patuakhali | 6143 | 15266 | 61840 | 160396 | 1536 | 3821 | 15460 | 40099 |
| Perojpur | 2471 | 6149 | 24675 | 64520 | 618 | 1537 | 6219 | 16130 |
| CHITTAGONG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bandarban | 1763 | 4366 | 17743 | 46021 | 441 | 1096 | 4436 | 11505 |
| Brahmanbaria | 11249 | 27992 | 113242 | 293722 | 2812 | 6996 | 26311 | 73430 |
| Chandpur | 6670 | 16597 | 67145 | 174156 | 1668 | 4149 | 16786 | 43539 |
| Chittagong | 12252 | 30466 | 123332 | 319891 | 3063 | 7621 | 30633 | 79973 |
| Comilla | 26879 | 66664 | 270562 | 701619 | 6720 | 16721 | 67645 | 175455 |
| Cox's Bazar | 3024 | 7525 | 30442 | 78957 | 756 | 1861 | 7610 | 19739 |
| Feni | 3525 | 8772 | 35466 | 92042 | 881 | 2193 | 8672 | 23010 |
| Khagrachari | 2523 | 6276 | 25397 | 65673 | 631 | 1569 | 6349 | 16466 |
| Lakshimpur | 3525 | 8772 | 35466 | 92042 | 881 | 2193 | 8672 | 23010 |
| Noakhali | 7024 | 17479 | 70711 | 183407 | 1756 | 4370 | 17676 | 45652 |
| Rangamati | 2704 | 6729 | 27223 | 70611 | 676 | 1662 | 6606 | 17653 |
| DHAKA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dhaka | 31899 | 79375 | 321115 | 832669 | 7975 | 19644 | 80279 | 206222 |
| Faridpur | 7024 | 17479 | 70711 | 183407 | 1756 | 4370 | 17676 | 45652 |
| Gazipur | 10342 | 25734 | 104110 | 270035 | 2586 | 6434 | 26026 | 67509 |
| Gopalganj | 4234 | 10535 | 42616 | 110540 | 1058 | 2634 | 10655 | 27635 |
| Jamalpur | 1642 | 4065 | 16525 | 42663 | 410 | 1021 | 4131 | 10716 |
| Kishoregonj | 7811 | 19435 | 76626 | 203936 | 1953 | 4859 | 19657 | 50964 |
| Madaripur | 6756 | 16812 | 66015 | 176414 | 1689 | 4203 | 17004 | 44103 |
| Manikgonj | 8813 | 21929 | 86715 | 230105 | 2203 | 5462 | 22179 | 57526 |
| Munsigonj | 9694 | 24122 | 97567 | 253115 | 2424 | 6030 | 24397 | 63279 |
| Mymensingh | 7223 | 17973 | 72712 | 186596 | 1806 | 4493 | 16176 | 47149 |
| Narayanganj | 12364 | 30765 | 124462 | 322623 | 3091 | 7691 | 31116 | 80706 |
| Narsingdi | 8934 | 22230 | 89933 | 233263 | 2233 | 5556 | 22483 | 58316 |
| Netrokona | 1763 | 4366 | 17743 | 46021 | 441 | 1096 | 4436 | 11505 |
| Rajbari | 4933 | 12276 | 49663 | 126613 | 1233 | 3069 | 12416 | 32203 |
| Shariatpur | 2964 | 7374 | 29633 | 77376 | 741 | 1844 | 7456 | 19345 |
| Sherpur | 1322 | 3269 | 13307 | 34516 | 330 | 822 | 3327 | 8629 |
| Tangail | 6169 | 15350 | 62101 | 161073 | 1542 | 3836 | 15525 | 40266 |
| KHULNA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bagerhat | 4640 | 11545 | 46706 | 121143 | 1160 | 2866 | 11676 | 30266 |
| Chuadanga | 4113 | 10234 | 41400 | 107362 | 1028 | 2556 | 10350 | 26646 |
| Jessore | 4285 | 10664 | 43140 | 111894 | 1071 | 2666 | 10785 | 27974 |
| Jhenaidah | 5409 | 13456 | 54447 | 141221 | 1352 | 3365 | 13612 | 35305 |
| Khulna | 14161 | 35237 | 142553 | 369747 | 3540 | 8809 | 35636 | 92437 |
| Kushlia | 3059 | 7611 | 30769 | 79660 | 765 | 1903 | 7697 | 19665 |
| Magura | 3084 | 7675 | 31050 | 80537 | 771 | 1919 | 7763 | 20134 |
| Meherpur | 1469 | 3655 | 14766 | 38351 | 367 | 914 | 3696 | 9566 |
| Narail | 1616 | 4020 | 16264 | 42186 | 404 | 1005 | 4066 | 10546 |
| Satkhira | 5849 | 14555 | 58663 | 152726 | 1462 | 3639 | 14721 | 38162 |
| RAJSHAHI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bogra | 2817 | 7009 | 28354 | 73543 | 704 | 1752 | 7089 | 18366 |
| Joypurhat | 2817 | 7009 | 28354 | 73543 | 704 | 1752 | 7089 | 18366 |
| Natore | 2523 | 6276 | 25397 | 65673 | 631 | 1569 | 6349 | 16466 |
| Chapainawabgonj | 2817 | 7009 | 28354 | 73543 | 704 | 1752 | 7089 | 18366 |
| Noagaon | 4234 | 10535 | 42616 | 110540 | 1058 | 2634 | 10655 | 27635 |
| Pabna | 4052 | 10063 | 40792 | 105803 | 1013 | 2521 | 10196 | 26451 |
| Rajshahi | 6489 | 16146 | 65319 | 169420 | 1622 | 4036 | 16330 | 42355 |
| Sirajgonj | 1149 | 2859 | 11566 | 30004 | 287 | 715 | 2892 | 7501 |
| RANGPUR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dinajpur | 6169 | 15350 | 62101 | 161073 | 1542 | 3836 | 15525 | 40266 |
| Galbandha | 1054 | 2623 | 10611 | 27522 | 264 | 656 | 2653 | 6861 |
| Kurigram | 1763 | 4366 | 17743 | 46021 | 441 | 1096 | 4436 | 11505 |
| Lalmonirhat | 1676 | 4171 | 16673 | 43765 | 419 | 1043 | 4216 | 10941 |

| | | | | | | | | | |
|---------------|--------------|------|-------|-------|--------|------|------|-------|-------|
| | Nilphamari | 4933 | 12276 | 49663 | 126613 | 1233 | 3069 | 12416 | 32203 |
| | Panchagar | 881 | 2193 | 8672 | 23010 | 220 | 548 | 2216 | 5753 |
| | Rangpur | 4553 | 11330 | 45636 | 116667 | 1138 | 2633 | 11459 | 29722 |
| | Thakurgaon | 1175 | 2924 | 11829 | 30661 | 294 | 731 | 2957 | 7670 |
| SYLHET | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Hobigonj | 2471 | 6149 | 24675 | 64520 | 618 | 1537 | 6219 | 16130 |
| | Maulavibazar | 3084 | 7675 | 31050 | 80537 | 771 | 1919 | 7763 | 20134 |
| | Sunamgonj | 2117 | 5267 | 21309 | 55270 | 529 | 1317 | 5327 | 13616 |
| | Sylhet | 4087 | 10169 | 41140 | 106705 | 1022 | 2542 | 10265 | 26676 |

Source: Personal Communications (Choudhury & Ahmed 2019)

This dataset has been compiled considering all available brands of LPG in Bangladesh.
Assuming 90% urban/rural consumption is domestic

Table VII.18: population growth and urbanization pattern for future projection

| District Name | 2015 | | | | | 2020 | | | | |
|----------------------------|-----------------|----------------|-----------------|----------------|-----------------|-----------------|----------------|-----------------|----------------|-----------------|
| | Population | No of Urban | | No of Rural | | Population | No of Urban | | No of Rural | |
| | | Household | Population | Household | Population | | Household | Population | Household | Population |
| Barisal Division | 9317344 | 715269 | 3196781 | 1369456 | 6120564 | 9850935 | 845420 | 3778466 | 1358695 | 6072469 |
| 1 Barguna | 999121 | 82876 | 342798 | 158675 | 656323 | 1056339 | 97956 | 405174 | 157428 | 651165 |
| 2 Barisal | 2601161 | 197233 | 892458 | 377624 | 1708703 | 2750126 | 233122 | 1054850 | 374656 | 1695276 |
| 3 Bhola | 1988431 | 143113 | 682231 | 274005 | 1306200 | 2102305 | 169154 | 806369 | 271852 | 1295936 |
| 4 Jhalokati | 763982 | 60720 | 262122 | 116255 | 501860 | 807735 | 71769 | 309818 | 115341 | 497916 |
| 5 Patuakhali | 1718791 | 133030 | 589717 | 254699 | 1129074 | 1817224 | 157236 | 697022 | 252698 | 1120202 |
| 6 Pirojpur | 1245858 | 98296 | 427454 | 188198 | 818404 | 1317207 | 116182 | 505233 | 186719 | 811973 |
| Chittagong Division | 31808513 | 2429321 | 12250845 | 3867144 | 19557668 | 33630140 | 2871360 | 14480006 | 3785695 | 19150134 |
| 7 Bandarban | 434590 | 30757 | 149108 | 58887 | 285482 | 459478 | 36353 | 176239 | 58424 | 283239 |
| 8 Brahmanbaria | 3178833 | 206934 | 1090657 | 396196 | 2088175 | 3360880 | 244588 | 1289113 | 393083 | 2071766 |
| 9 Chandpur | 2703792 | 194487 | 927671 | 372366 | 1776121 | 2858635 | 229876 | 1096470 | 369440 | 1762165 |
| 10 Chittagong | 8523543 | 857247 | 4261772 | 857247 | 4261772 | 9011674 | 1013231 | 5037243 | 799449 | 3974431 |
| 11 Comilla | 6028973 | 404537 | 2068541 | 774527 | 3960433 | 6374244 | 478146 | 2444932 | 768441 | 3929312 |
| 12 Cox's Bazar | 2562753 | 159713 | 879281 | 305786 | 1683472 | 2709518 | 188774 | 1039274 | 303383 | 1670244 |
| 13 Feni | 1608578 | 106614 | 551903 | 204124 | 1056675 | 1700699 | 126014 | 652327 | 202520 | 1048371 |
| 14 Khagrachhari | 687041 | 51372 | 235724 | 98356 | 451317 | 726387 | 60719 | 278616 | 97584 | 447771 |
| 15 Lakshmipur | 1935153 | 140278 | 663951 | 268577 | 1271202 | 2045977 | 165803 | 784763 | 266466 | 1261213 |
| 16 Noakhali | 3478290 | 228045 | 1193401 | 436615 | 2284889 | 3677486 | 269540 | 1410552 | 433184 | 2266934 |
| 17 Rangamati | 666967 | 49338 | 228836 | 94463 | 438130 | 705163 | 58316 | 270475 | 93721 | 434688 |
| Dhaka Division | 53073188 | 5122691 | 22345977 | 7018897 | 30727211 | 56112611 | 5952362 | 25969161 | 6884557 | 30143451 |
| 18 Dhaka | 13478547 | 2026695 | 8761056 | 1091297 | 4717492 | 14250444 | 2293019 | 9912330 | 1003536 | 4338113 |
| 19 Faridpur | 2140825 | 161333 | 734517 | 308888 | 1406308 | 2263427 | 190689 | 868169 | 306461 | 1395257 |
| 20 Gazipur | 3809355 | 317333 | 1306990 | 607566 | 2502366 | 4027512 | 375074 | 1544809 | 602791 | 2482702 |
| 21 Gopalganj | 1312063 | 95943 | 450169 | 183692 | 861894 | 1387202 | 113400 | 532081 | 182248 | 855121 |
| 22 Jamalpur | 2565757 | 216314 | 880311 | 414156 | 1685446 | 2712694 | 255675 | 1040492 | 410901 | 1672201 |
| 23 Kishoreganj | 3258747 | 240871 | 1118076 | 461172 | 2140671 | 3445371 | 284700 | 1321521 | 457548 | 2123850 |
| 24 Madaripur | 1304830 | 96817 | 447687 | 185366 | 857143 | 1379555 | 114434 | 529148 | 183909 | 850407 |
| 25 Manikganj | 1558773 | 124710 | 534815 | 238770 | 1023958 | 1648041 | 147402 | 632130 | 236894 | 1015912 |
| 26 Munshiganj | 1617854 | 120281 | 555086 | 230290 | 1062768 | 1710506 | 142167 | 656089 | 228480 | 1054417 |
| 27 Mymensingh | 5718962 | 443649 | 1962176 | 849412 | 3756786 | 6046478 | 524376 | 2319213 | 842737 | 3727265 |
| 28 Narayanganj | 3299382 | 259428 | 1132018 | 496702 | 2167364 | 3488333 | 306634 | 1338000 | 492798 | 2150333 |
| 29 Narsingdi | 2489959 | 183527 | 854305 | 351381 | 1635654 | 2632556 | 216922 | 1009754 | 348620 | 1622801 |
| 30 Netrokona | 2495217 | 183976 | 856109 | 352241 | 1639108 | 2638114 | 217453 | 1011886 | 349473 | 1626228 |

| | | | | | | | | | | | |
|--------------------------|------------------|-----------------|----------------|----------------|----------------|-----------------|-----------------|----------------|----------------|----------------|-----------------|
| 31 | Rajbari | 1174818 | 91443 | 403080 | 175077 | 771738 | 1242098 | 108082 | 476424 | 173701 | 765674 |
| 32 | Shariatpur | 1293495 | 95178 | 443798 | 182227 | 849697 | 1367572 | 112496 | 524552 | 180796 | 843020 |
| 33 | Sherpur | 1520116 | 131103 | 521552 | 251010 | 998564 | 1607171 | 154958 | 616453 | 249037 | 990718 |
| 34 | Tangail | 4034488 | 334090 | 1384233 | 639650 | 2650255 | 4265537 | 394881 | 1636108 | 634624 | 2629430 |
| Khulna Division | | 17556344 | 1435952 | 6023582 | 2749276 | 11532762 | 18561770 | 1697237 | 7119631 | 2727673 | 11442139 |
| 35 | Bagerhat | 1651909 | 136010 | 566770 | 260405 | 1085139 | 1746511 | 160758 | 669899 | 258359 | 1076612 |
| 36 | Chuadanga | 1263493 | 106537 | 433504 | 203976 | 829989 | 1335851 | 125922 | 512385 | 202373 | 823467 |
| 37 | Jessore | 3093835 | 252041 | 1061495 | 482558 | 2032340 | 3271014 | 297902 | 1254644 | 478766 | 2016370 |
| 38 | Jhenaidah | 1982286 | 162162 | 680122 | 310475 | 1302164 | 2095808 | 191668 | 803877 | 308035 | 1291931 |
| 39 | Khulna | 2594689 | 210163 | 890238 | 402379 | 1704451 | 2743283 | 248404 | 1052225 | 399217 | 1691058 |
| 40 | Kushtia | 2178728 | 183263 | 747522 | 350876 | 1431206 | 2303500 | 216610 | 883540 | 348119 | 1419960 |
| 41 | Magura | 1027813 | 79060 | 352643 | 151368 | 675170 | 1086674 | 93445 | 416809 | 150178 | 669865 |
| 42 | Meherpur | 733456 | 63858 | 251649 | 122263 | 481808 | 775460 | 75478 | 297439 | 121303 | 478022 |
| 43 | Narail | 807627 | 62436 | 277097 | 119540 | 530530 | 853878 | 73797 | 327517 | 118600 | 526361 |
| 44 | Satkhira | 2222509 | 180422 | 762543 | 345437 | 1459966 | 2349788 | 213252 | 901295 | 342722 | 1448494 |
| Rajshahi Division | | 20686608 | 1722794 | 7097575 | 3298465 | 13589033 | 21871300 | 2036273 | 8389048 | 3272546 | 13482251 |
| 45 | Bogra | 3805956 | 332952 | 1305823 | 637471 | 2500132 | 4023917 | 393536 | 1543431 | 632461 | 2480486 |
| 46 | Joypurhat | 1022608 | 93133 | 350857 | 178314 | 671751 | 1081171 | 110080 | 414699 | 176912 | 666473 |
| 47 | Naogaon | 2909864 | 251806 | 998374 | 482108 | 1911490 | 3076508 | 297624 | 1180038 | 478320 | 1896470 |
| 48 | Natore | 1909957 | 162754 | 655306 | 311609 | 1254650 | 2019337 | 192369 | 774545 | 309161 | 1244792 |
| 49 | Chapai Nawabganj | 1843759 | 137453 | 632594 | 263168 | 1211165 | 1949348 | 162464 | 747700 | 261100 | 1201648 |
| 50 | Pabna | 2823717 | 226828 | 968817 | 434286 | 1854900 | 2985428 | 268102 | 1145103 | 430873 | 1840324 |
| 51 | Rajshahi | 2904314 | 243342 | 996470 | 465903 | 1907844 | 3070639 | 287621 | 1177787 | 462242 | 1892852 |
| 52 | Sirajganj | 3466434 | 274525 | 1189334 | 525607 | 2277101 | 3664952 | 324478 | 1405744 | 521476 | 2259207 |
| Rangpur Division | | 17668254 | 1922575 | 7950714 | 2349814 | 9717540 | 18680089 | 2272407 | 9397424 | 2244656 | 9282664 |
| 53 | Dinajpur | 3346285 | 360463 | 1505828 | 440566 | 1840457 | 3537922 | 426053 | 1779828 | 420850 | 1758093 |
| 54 | Gaibandha | 2662650 | 308346 | 1198193 | 376867 | 1464458 | 2815137 | 364452 | 1416216 | 360002 | 1398921 |
| 55 | Kurigram | 2315746 | 255851 | 1042086 | 312707 | 1273660 | 2448366 | 302406 | 1231703 | 298713 | 1216662 |
| 56 | Lalmonirhat | 1405714 | 146268 | 632571 | 178771 | 773143 | 1486217 | 172882 | 747674 | 170771 | 738543 |
| 57 | Nilphamari | 2052708 | 212304 | 923719 | 259482 | 1128989 | 2170264 | 250934 | 1091798 | 247870 | 1078465 |
| 58 | Panchagarh | 1105283 | 115113 | 497377 | 140694 | 607906 | 1168581 | 136059 | 587880 | 134398 | 580701 |
| 59 | Rangpur | 3224255 | 362683 | 1450915 | 443279 | 1773340 | 3408903 | 428676 | 1714923 | 423441 | 1693980 |
| 60 | Thakurgaon | 1555611 | 161548 | 700025 | 197447 | 855586 | 1644699 | 190943 | 827401 | 188611 | 817297 |
| Sylhet Division | | 11090635 | 687643 | 3805197 | 1316564 | 7285438 | 11725779 | 812767 | 4497590 | 1306218 | 7228190 |
| 61 | Habiganj | 2337824 | 151015 | 802107 | 289134 | 1535717 | 2471708 | 178494 | 948059 | 286862 | 1523649 |
| 62 | Maulvibazar | 2147643 | 138680 | 736856 | 265517 | 1410787 | 2270636 | 163914 | 870935 | 263431 | 1399701 |
| 63 | Sunamganj | 2761930 | 169073 | 947618 | 323707 | 1814312 | 2920102 | 199837 | 1120047 | 321164 | 1800055 |
| 64 | Sylhet | 3843238 | 228875 | 1318615 | 438205 | 2524623 | 4063334 | 270522 | 1558550 | 434762 | 2504784 |

Data Source: (WB, 2018)

<https://data.worldbank.org/country/bangladesh>

Table VII.19a: Heat Utilization Efficiency of Cooking Devices by Water Boiling Test

| Heating Devices (Heat input rate) | Pan Type and Heat Utilization Efficiency (Percent) | | | |
|---|--|----|----|------|
| | FA | PC | SA | SC |
| Electric Coil Heater 876Watt (3154kJ/hr) | 77 | 63 | 68 | 70 |
| Natural gas: top surface burner. Input 6300 kJ/hr (average) | 56 | 57 | 54 | 50 |
| Kerosene: wick control domestic burner (10 No. wicks). Input 5000 kJ/hr (average) | 54 | 53 | 53 | 50 |
| Firewood (Sundari variety). One-mouth traditional stove with 0.43m depth. Input 46,000-48,000 kJ/hr (average) | 8 | 12 | 13 | 12.5 |

Notes: Cold start experiment, 5.45kg water load for pan types FA, SA, SC, and 3.3kg water load for pan PC, one hour duration.

FA: Flat bottom aluminum pan (water capacity 7.3kg);

PC: Pressure Cooker (water capacity 4.4kg);

SA: Spherical bottom aluminum pan (water capacity 7.4kg);

SC: Spherical bottom clay pan (water capacity 8.8kg).

Source: Islam 1980 (Quoted in Islam, Morse and Soesastro 1984)

Reference:

Islam, M.N; Morse, R. and Soesastro, M.H. (1984): Rural Energy to Meet Development Needs: Asian Village Approaches, East-West Center, Hawaii and Westview Press, USA, 1984.

Table VII.19b: Energy Conversion Factor

| Fuel source | Energy Content (MJ per unit) | Cooking Stoves Efficiency (%) | Efficient Cooking Energy (MJ per unit) |
|--|------------------------------|-------------------------------|--|
| Electricity (kWh) | 3.6 | 70 | 2.5 |
| LPG (kg) | 45.5 | 60 | 27.3 |
| Natural Gas (m ³) | 38.0 | 60 | 22.8 |
| Biogas (60% methane ((m ³)) | 23.0 | 60 | 13.8 |
| Kerosene, pressure (kg) | 43.0 | 55 | 23.7 |
| Kerosene, wick (kg) | 43.0 | 35 | 15.1 |
| Charcoal, efficient (kg) | 30.0 | 30 | 9 |
| Charcoal, traditional (kg) | 22.5 | 20 | 6 |
| Bituminous coal (kg) | 22.0 | 25 | 5.6 |
| Fuelwood efficient (15% moisture) (kg) | 16.0 | 25 | 4.0 |
| Fuelwood traditional (15% moisture) (kg) | 16.0 | 15 | 2.4 |
| Crop residues (5% moisture) (kg) | 13.5 | 12 | 1.6 |
| Dung (15% moisture) (kg) | 14.5 | 12 | 1.7 |
| Leaves and grass (kg) | 13.5 | 12 | 1.6 |

Source: O'Sullivan and Barnes (2006) and various World Bank reports.

Note: Energy=total energy by energy source; efficient cooking energy=energy absorbed in to cooking pans or devices.

Reference:

O'Sullivan, K. and Barnes, D.F. (2006): Energy Policies and Multitopic Household Surveys: Guidelines for Questionnaire Design in Living Standards Measurement Studies, Energy and Mining Sector Board, The World Bank, Energy and Mining Sector Board Discussion Paper, Paper Number 17, April 2006 [Quoted in Restoring Balance: Bangladesh's Rural Energy Realities by M. Asaduzzaman, Douglas F. Barnes, Shahidur R. Khandaker, World Bank Working Paper Number 181, The World Bank, 2010].

COMPONENT-8

**Compilation of Data of Total Supply and Demand of Biomass
Fuels for the Base year 2015 and Future Projections up to 2040**

Component 8: Compilation of data of total supply and demand of Biomass Fuels for the Base Year 2015 and Future Projections up to 2040

8.1 Introduction

SREDA intends to be a strong data facilitation centre to bring confidence to private investors in Renewable Energy Development projects. At the initial stage it is planned to implement some pilot projects based on proper analyses of related data. The lessons learned from the pilot projects will be utilized to scale up the dissemination process. In this background, SREDA has engaged a Firm (NACOM) to undertake the present study to assess the availability of different type of Biomass fuels (e.g. tree residues, agriculture residues and animal dung & poultry litters, municipal solid wastes, industrial wastes etc.) and to assess their prospects for generation of electricity. As the supply and demand of Biomass fuels depends on specific locations; data are to be gathered and analysed according to 64 districts. In the ToR, the tasks of the project has been grouped under the following 7 (seven) components.

Component 1: Assessment of the Roles of Biomass Fuels in Total Energy Consumption in Bangladesh and in Selected Developed (EU and USA) and Developing (Bangladesh, China & India) Countries.

Component 2: Development of a Conceptual and Analytical Model to Estimate Supply and Demand of Biomass Fuels for 64 districts of Bangladesh.

Component 3: Assessment of Supply of Biomass Fuels from Tree Resources for 64 districts of Bangladesh.

Component 4: Assessment of Biomass Fuel Supply from Agricultural Crop Lands and Other Type of Lands

Component 5: Assessment of the Biomass Fuels Supply from Livestock and Poultry Resources for 64 districts of Bangladesh

Component 6: Assessment of Supply of Biomass Fuels from Municipalities and Industrial for 64 districts of Bangladesh.

Component 7: Assessment of Consumption of Biomass Fuels from Cooking and other End -uses Including Power Generation.

On the basis of the data gathered by the above seven components, Supply-Demand Balance of Biomass fuels are to be established for 64 districts for the base year 2015 and to be projected up to 2040. Potential locations for Biomass fuels based power generation have been identified and additional sites have been indicated for establishing biomass fuels based power generation (pilot) plants.

8.2 Objective

The objective of Component 8 is the compilation of data of total supply and demand of biomass fuels according to 64 districts for the base year 2015 and projections up to the year 2040. The detailed activities, approaches and methodologies for analyses of Supply and Demand data of Biomass Fuels have been presented shown in Table 8.1.

Table 8.1: Activities, Approaches and Methodologies for Compilation of Data of Total Supply and Demand of Biomass Fuels for the Base Year 2015

| Activities | Approach and methodology |
|--|---|
| 8.1 Compile (compute & tabulate) the supply of total Biomass fuels available from different sources (tree residues, crop residues, animal dung and poultry litters, MSW, Industrial Wastes) in physical units (tones) according to districts (Component 3, Component 4, Component 5, Component 6). | Status of Bangladesh, with reference to use of biomass fuels has been assessed in Component 1. A conceptual and analytical model has been developed in Component 2 to carry out the assigned task. Availability of biomass fuels according to districts have been presented as outcomes of the Components 3, Component 4, Component 5 and Component 6. These data have been compiled and presented in heat unit (TJ). |
| 8.2 Estimate (compute and tabulate) the supply of total Biomass fuels in heat units (e.g. GJ) for the base year (2015) according to districts. | The total biomass fuels consumption estimated in heat unit (TJ) has been presented. |
| 8.3 Future projection(s) of Biomass fuels supply may be made in consultation with SREDA, relevant agencies and Ministries | Projections of biomass supply made by other components have been compiled in terms of biomass fuels and have been extended up to 2040. |
| 8.4 Prepare a Report on Total Supply of Biomass fuels from Different Sources in Bangladesh according to districts. | The report has been prepared. |
| 8.5 Establish a Demand/Supply balance of Biomass fuels disaggregated at district Level for 2015 by comparing Biomass fuels consumption shown in [7.5] and supply data shown in [8.2]. | It has been done according to TOR. |
| 8.6 Districts having excess supply of biomass fuels may be identified for subsequent decisions on Biomass fuels based electricity generation. | It has been done according to TOR. |
| 8.7 Future projections of supply-demand balance of biomass fuels disaggregated at districts level are to be made in consultation with relevant Ministries (e.g. Ministry of Agriculture, Ministry of Environment, Forest and Climate Change), SREDA, relevant agencies and Ministries. | It has been done according to TOR. |
| 8.8 Estimate the quantity of excess biomass fuels may be available through supply-demand analysis (specific to location and season) and assess their prospects of power generation (specific to biogas technology and any other) according to districts. | It has been done according to TOR. |
| 8.9 Identify the districts having potential for biomass based power generation and select at least (ten) pilot power plant sites of different capacities (MW) | It has been done according to TOR. |
| 8.10 Future projection of Excess Biomass Fuels Disaggregated at District level are to be made in consultation with the relevant Ministries (e.g. Ministry of Environment, Forest and Climate Change, Ministry of Livestock & Fisheries) and also in | It has been done according to TOR. |

| Activities | Approach and methodology |
|--|------------------------------------|
| consultation with SREDA. | |
| 8.11 Prepare a Report on Excess Supply of Biomass Fuels for different End-Uses in Bangladesh | It has been done according to TOR. |
| 8.12 Prepare a Biomass Fuels Action Plan for Bangladesh with Investment requirement up to 2040 | It has been done according to TOR. |

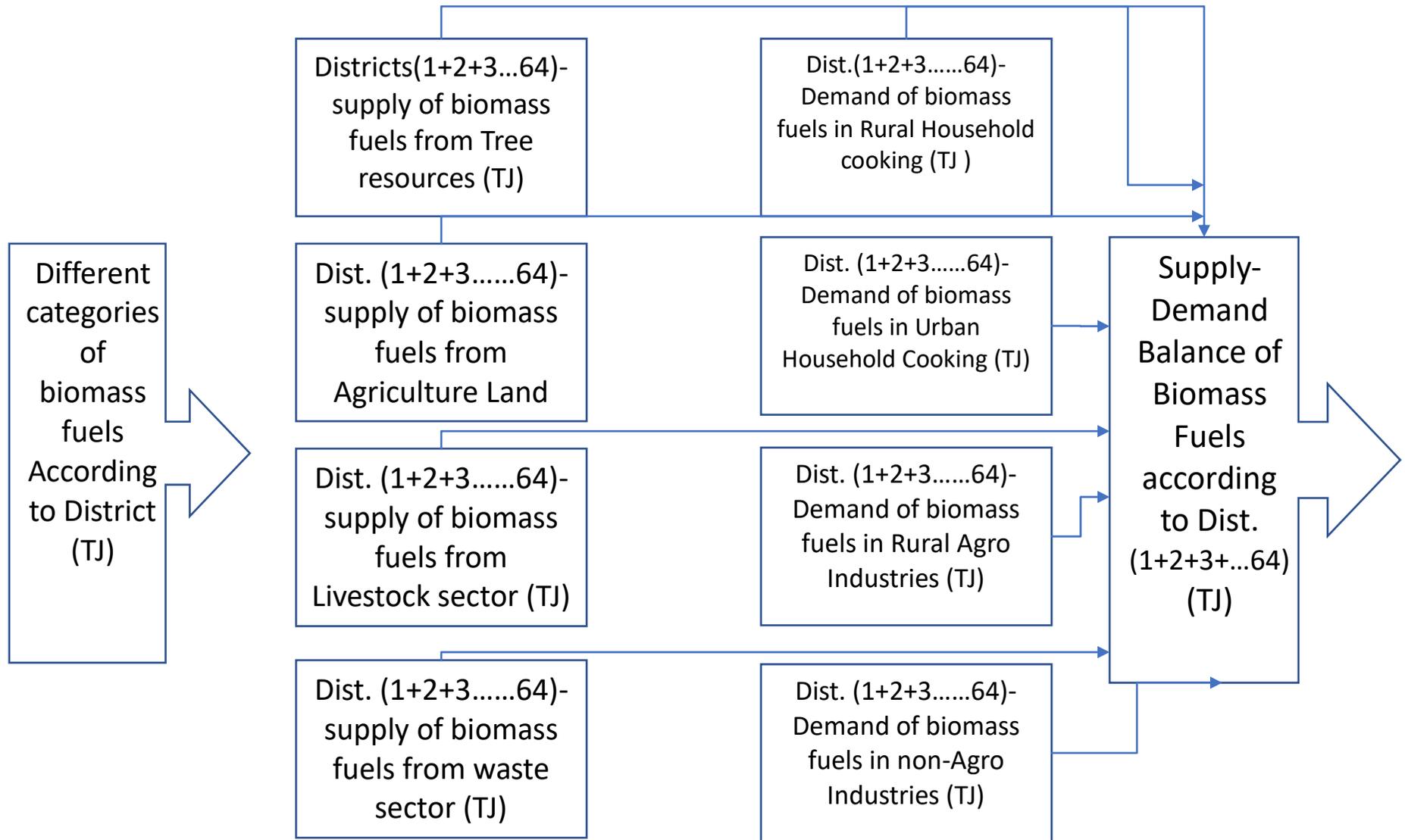
8.3 Conceptual Diagram

In order to estimate and compile the district wise supply and demand of all categories of biomass fuels has been presented in line with a Conceptual Framework and analytical model shown in Figure 2.1 of Component 2. In line with Figure 2.1, a Simplified Conceptual Diagram has been prepared and is shown Figure 8.1.

Figure 8.1 indicates that the arithmetic sum of all the supply of biomass fuels (e.g. tree residues, agriculture residues, and animal dung and wastes) of 64 districts estimated in Component 3, Component 4, Component 5 and Component 6; have been compiled in Heat Units (TJ).

The Consumption of biomass fuels in 2015 has been estimated for the following end uses: Rural Cooking, Rice Parboiling, Urban Cooking, Urban commercial Units, Rural Agro Industries and Rural non-Agro industries (Brick Kiln) and the data have been presented in Component 7. Supply-Demand balance of biomass fuels according to districts has been presented in Table 8.2 in heat units (TJ).

Figure 8.1: Simplified Conceptual Diagram for Computation of Supply and Demand of Biomass Fuels



Compiled by Utpal Bhattacharjee

8.4 Organizations

Biomass Fuels consist of tree residues, agricultural residues, animal & poultry residues, municipal and industrial wastes. All these residues are the byproducts of the respective sectors-Forestry, Agriculture, Livestock & Poultry, Municipalities and Industries etc.. Policy planners and decision makers and national statistical agency (BBS) pay attention to the planning and development of the main products; planning and development of byproducts are not considered by the above mentioned agencies. These resources are being managed by the individual consumers according to their own requirements. Considering the important roles of biomass fuels in supplying part of the country's energy need and their contribution in releasing net zero GHGs (biomass fuels are carbon neutral), Sustainable and Renewable Energy Authority (SREDA) has undertaken the present study "A Comprehensive Assessment of the Availability and use of Biomass Fuels for Various end uses with Special Attention to Power Generation" in order to ensure sustainable supply of biomass fuels and use excess biomass fuels for power generation to save fossil fuels and to decrease the emission of GHGs.

It has been a challenging task for the study team to collect data and information from the relevant Government agencies on byproducts through their publications and reports. The experts had to interact with the research organizations to gather and authenticate data on coefficients of residues in relation to main products. Estimated supplies of different types of biomass fuels from respective sources have been presented in the reports of **Component-3**, **Component-4**, **Component-5** and **Component-6** accordingly.

Prior to Industrial Revolution, the whole world dependent on renewable biomass fuels to meet the fuel demand. With the discovery of fossil fuels (coal, oil and natural gas), biomass fuels have been substituted with fossil fuels, because of their superior quality. In most of the developed countries, biomass fuels have been totally substituted by fossil fuels and other renewable sources of energy (e.g. hydropower); which is commonly known as energy transition towards modern fuels and energy (e.g. electricity). Accumulation of carbon dioxide released from combustion of fossil fuels and its impact on earth's climate remained unattended till the end of 20th century. Developing countries tried to follow energy transition path of developed countries (substitutions of biomass fuels with fossil fuels). Global consensus on the effects of GHG accumulation on climate change has made both developed and developing countries to move towards a new transitional path commonly known as Low Carbon Footprint. As a result, new institutions and strategies have been evolved at global level (e.g. UN, World Bank, TNCs etc.), regional level (e.g. EU, OECD etc.) and country level (e.g. Bangladesh, China, Germany India, USA).

Similar to other developing countries, Bangladesh is also trying to follow **Low Carbon Path of Development**. The study team had to identify and estimate the dynamic balance between biomass fuels and commercial fuels. It was very complex and challenging tasks for the experts to estimate and analyse the data of biomass fuels consumptions; which have been presented in **Component-7**. It has been stressed that there is lack of institutional mechanism in Bangladesh to pay attention to this important aspect. The objectives of present component (**Component 8**) are to establish supply-demand balance for the base year 2015 and project up to 2040.

8.5 Data Collection and Analysis

Data collected and analyzed under the following components for estimating the supplies of biomass fuels (**Component-3, Component-4, Component-5, Component-6**); and the data have been shown in Table 8.2 and Figure 8.2. It may be noted that as MSW and wet season agriculture residues are not generally used as fuels and thus not considered during Supply-Demand balance of biomass fuels. Total supply of biomass fuels in Bangladesh in 2015 (in heat unit) was estimated as 12,32,908 TJ (100%). The composition of biomass fuels was estimated as follows: tree biomass fuels-2,44,379 TJ (19.8%), agriculture residues-8,62,112 TJ (69.93%), animal residues-1,26,417 TJ (10.25%)

Consumptions of biomass fuels in 2015 in heat unit has been estimated in **Component 7** as 6,87,533 TJ (100%). The data have been presented in Table 8.2 and in Figure 8.3. Different end uses in which biomass fuels were consumed were as follows: rural cooking-4,27,695 TJ (62.2%), urban cooking-2,01,386 TJ (29.3%), rice parboiling-11,818 TJ (1.7%) , brick kiln-19,655 TJ (2.9%) , rural agro-industries-15,825 TJ (2.3%), urban commercial units-11,156 TJ (1.6%).

Comparison of supply and demand of biomass fuels at country level in 2015 indicate excess supply 5,45,375 TJ; which was 79% of the total biomass fuels consumption in 2015.

The following assumptions have been made in establishing the supply and demand of biomass fuels at the country level. Tree biomass fuels are considered as best because of quality, animal residues are second best because of nearness of availability and agricultural residues are considered as the least preferred options because of quality.

According to above assumption, composition of biomass fuels consumed in 2015 has been estimated as follows: tree biomass fuels-16.8 million tonnes (2,44,379 TJ, 35.5%); animal residues -10.9 million tonnes (1,26,417 TJ, 18.4%) and balance agricultural residues (3,16,736 TJ, 46.1%). However, choice of particular type of biomass fuels would vary according to locations, season, availability and affordability.

Supply-Demand balance of biomass fuels for 64 districts of Bangladesh is presented in Table 8.2 and in Figure 8.4. Supply and Demand balance indicate that in some of the districts biomass fuels are in excess and in some districts they are in deficit.

Considering the location specific nature of Supply and Consumptions of biomass fuels, the Districts have been ranked within the Division according to the quantity of excess supply of biomass fuels. It means the District, which has been ranked as “1 (one)” has the highest quantity of biomass fuels within that Division.

It may be observed from Figure 8.4 that **Chattogram District** of Chattogram Division and the following Districts of Dhaka Division (**Dhaka, Gazipur, Munsiganj, Narayanganj and Narsingdhi**) had negative balance of biomass fuels. It means that the Districts having negative balance of biomass fuels may possibly meeting their demands from the districts located within economic distance of transport. It may be noted that biomass fuels balancing exercise has been carried out as heat balance of supplied fuels and consumption requirements of the end-uses; it has not been possible to ascertain the type of biomass fuels imported from other areas.

On the basis of Supply-Demand balance per capita **deficit** of biomass fuels in the deficit Districts: (**Chattogram, Dhaka, Gazipur, Munsiganj, Narayanganj and Narsingdhi**) is shown in Table 8.2 and Figure 8.6. Organization involved with the promotion of Improved Cookstoves may consider this assessment in implementing their program. LPG marketing companies may also consider these districts for increasing their market penetration.

Excess availability of biomass fuels in the following Districts (**Barishal, Faridpur, Jamalpur, Netrokona, Chuadanga, Jhenaidah, Kusthia, Bogura, Naogaon, Pabna, Dinajpur, Lalmonirhat, Thakurgaon and Habiganj**) are shown in Table 8.2 and Figure 8.5 and in Figure 8.6 on per capita basis (GJ/person).

Average per capita consumption for household cooking have been considered as 4.44 GJ/person/year; the value has been plotted on Figure 8.6. Therefore, districts having more than 4.44 GJ/person/year are in a better position in terms of supply of biomass fuel sources.

It may be observed that Asaduzzaman et.al. (2010) estimated per capita consumption of biomass fuels as 9.06 GJ/person/year; the value has been plotted on Figure 8.6.

SREDA may consider in sending a multidisciplinary team of experts to visit the districts identified as excess and deficit supply of biomass fuels in rainy season to assess the practical situation of biomass availability.

Table 8.2 Supply-Demand Balance of Biomass fuels According to Districts in 2015

(In Terajoules)

| Serial No. of District | Division/District | Tree Biomass Fuels Resources includes (Forest, Homestead, strip plantation) | Agriculture Land includes Biomass Fuels Resources from crops like (rice, wheat, pulses etc.) | Livestock Biomass Fuels Resources includes (cattle, buffalo, poultry) | Waste Sector includes (MSW, Industrial wastes Sewage Sludge and so on) | Total Supply 7=3+4+5 | Rural Cooking | Urban Cooking | Rice Parboiling | Brick Kiln | Rural Agro | Urban Commercial units | Total Demand/Consumption 13=8+9+10+11+12 | Total Excess (Supply-Demand) 14=(7-13) | Rank of biomass fuels in terms of excess (District wise) |
|------------------------|--------------------------------|---|--|---|--|-------------------------|---------------|---------------|-----------------|------------|------------|------------------------|---|---|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7=3+4+5 | 8 | 9 | 10 | 11 | 12 | 13 | 13=8+9+10+11+12 | 14=(7-13) | 15 |
| | (1) Barishal Division | | | | | | | | | | | | | | |
| 1 | Barguna | 3931 | 3895 | 1256 | 0 | 9082 | 3092 | 1503 | 92 | 122 | 0.4 | 61 | 4870 | 4212 | 4 |
| 2 | Barishal | 8759 | 10244 | 2175 | 0 | 21178 | 7273 | 3336 | 166 | 358 | 22 | 159 | 11314 | 9865 | 2 |
| 3 | Bhola | 3935 | 11469 | 2142 | 0 | 17546 | 5374 | 2639 | 228 | 159 | 11 | 121 | 8533 | 9013 | 3 |
| 4 | Jhalakathi | 2718 | 3132 | 830 | 0 | 6680 | 2250 | 1039 | 57 | 99 | 3 | 47 | 3495 | 3186 | 6 |
| 5 | Patuakhali | 3929 | 10832 | 3682 | 0 | 18443 | 4929 | 2319 | 187 | 114 | 0 | 105 | 7654 | 10789 | 1 |
| 6 | Pirojpur | 3926 | 4449 | 801 | 0 | 9177 | 3664 | 1813 | 79 | 81 | 4 | 76 | 5717 | 3460 | 5 |
| | | | | | | | | | | | | | | | |
| | (2) Chattogram Division | | | | | | | | | | | | | | |
| 7 | Bandarban | 3981 | 1244 | 545 | 0 | 5770 | 1142 | 514 | 29 | 64 | 2 | 27 | 1777 | 3993 | 4 |
| 8 | Brahmanbaria | 1812 | 11522 | 1622 | 0 | 14957 | 7551 | 2755 | 193 | 436 | 0 | 194 | 11129 | 3827 | 5 |
| 9 | Chandpur | 5285 | 7913 | 1187 | 0 | 14385 | 7156 | 2666 | 113 | 435 | 37 | 165 | 10573 | 3813 | 6 |
| 10 | Chattogram | 4012 | 12756 | 4239 | 0 | 21007 | 16525 | 7732 | 252 | 1116 | 302 | 759 | 26685 | -5678 | 11 |
| 11 | Cumilla | 3926 | 21005 | 3491 | 0 | 28423 | 14699 | 3323 | 369 | 830 | 11 | 368 | 19600 | 8823 | 1 |
| 12 | Cox's Bazar | 3974 | 7529 | 1319 | 0 | 12821 | 5929 | 2948 | 147 | 197 | 4 | 157 | 9381 | 3441 | 7 |
| 13 | Feni | 3926 | 5314 | 1286 | 0 | 10526 | 3936 | 798 | 103 | 297 | 8 | 98 | 5240 | 5286 | 2 |
| 14 | Khagrachhari | 4103 | 2204 | 983 | 0 | 7289 | 1915 | 879 | 41 | 77 | 14 | 42 | 2968 | 4321 | 3 |
| 15 | Lakshmipur | 3926 | 6298 | 1039 | 0 | 11262 | 5197 | 2344 | 124 | 245 | 3 | 118 | 8031 | 3232 | 8 |
| 16 | Noakhali | 3956 | 10419 | 695 | 0 | 15070 | 8396 | 3317 | 217 | 541 | 5 | 212 | 12688 | 2383 | 10 |
| 17 | Rangamati | 3926 | 1046 | 808 | 0 | 5780 | 1835 | 831 | 20 | 53 | 21 | 41 | 2801 | 2979 | 9 |

| Serial No. of District | Division/District | Tree Biomass Fuels Resources includes (Forest, Homestead, strip plantation) | Agriculture Land includes Biomass Fuels Resources from crops like (rice, wheat, pulses etc.) | Livestock Biomass Fuels Resources includes (cattle, buffalo, poultry) | Waste Sector includes (MSW, Industrial wastes Sewage Sludge and so on) | Total Supply 7=3+4+5 | Rural Cooking 8 | Urban Cooking 9 | Rice Parboiling 10 | Brick Kiln 11 | Rural Agro 12 | Urban Commercial units 13 | Total Demand/Consumption 13=8+9+10+11+12 | Total Excess (Supply-Demand) 14=(7-13) | Rank of biomass fuels in terms of excess (District wise) 15 |
|------------------------|---------------------------|---|--|--|--|-------------------------|--------------------|--------------------|-----------------------|------------------|------------------|------------------------------|---|---|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7=3+4+5 | 8 | 9 | 10 | 11 | 12 | 13 | 13=8+9+10+11+12 | 14=(7-13) | 15 |
| | (3) Dhaka Division | | | | | | | | | | | | | | |
| 18 | Dhaka | 3928 | 6458 | 1246 | 0 | 11632 | 21024 | 10680 | 77 | 1352 | 4 | 1560 | 34697 | -23064 | 17 |
| 19 | Faridpur | 4990 | 18810 | 1461 | 0 | 25261 | 5973 | 2820 | 85 | 296 | 624 | 131 | 9929 | 15333 | 3 |
| 20 | Gazipur | 3926 | 5975 | 1755 | 0 | 11656 | 11858 | 2723 | 118 | 921 | 59 | 233 | 15911 | -4256 | 15 |
| 21 | Gopalganj | 3473 | 9641 | 1335 | 0 | 14448 | 3546 | 1673 | 117 | 116 | 56 | 80 | 5587 | 8861 | 6 |
| 22 | Jamalpur | 3926 | 22798 | 2605 | 0 | 29329 | 8166 | 3968 | 250 | 191 | 746 | 157 | 13478 | 15851 | 1 |
| 23 | Kishoreganj | 3775 | 15664 | 1631 | 0 | 21070 | 9008 | 3897 | 322 | 339 | 2 | 199 | 13767 | 7303 | 11 |
| 24 | Madaripur | 3473 | 8935 | 709 | 0 | 13117 | 3545 | 1571 | 47 | 193 | 66 | 80 | 5502 | 7615 | 8 |
| 25 | Manikganj | 2719 | 11343 | 2250 | 0 | 16312 | 4572 | 1668 | 77 | 243 | 57 | 95 | 6712 | 9600 | 5 |
| 26 | Munshiganj | 907 | 3704 | 567 | 0 | 5178 | 4388 | 1556 | 38 | 252 | 5 | 99 | 6338 | -1159 | 14 |
| 27 | Mymensingh | 3926 | 29871 | 4438 | 0 | 38235 | 16643 | 7201 | 583 | 761 | 206 | 349 | 25743 | 12492 | 4 |
| 28 | Narayanganj | 907 | 2170 | 426 | 0 | 3503 | 9574 | 1742 | 38 | 821 | 2 | 202 | 12379 | -8876 | 16 |
| 29 | Narsingdi | 2718 | 5427 | 944 | 0 | 9088 | 6772 | 2341 | 94 | 437 | 4 | 152 | 9799 | -711 | 13 |
| 30 | Netrokona | 3926 | 20173 | 2307 | 0 | 26406 | 6922 | 3379 | 387 | 98 | 2 | 152 | 10940 | 15467 | 2 |
| 31 | Rajbari | 906 | 11266 | 847 | 0 | 13019 | 3377 | 1554 | 57 | 198 | 196 | 72 | 5454 | 7565 | 9 |
| 32 | Shariatpur | 906 | 6862 | 798 | 0 | 8566 | 3528 | 1719 | 47 | 144 | 32 | 79 | 5549 | 3018 | 12 |
| 33 | Sherpur | 3926 | 11021 | 1434 | 0 | 16381 | 4951 | 2408 | 197 | 58 | 9 | 93 | 7716 | 8664 | 7 |
| 34 | Tangail | 4197 | 19516 | 3192 | 0 | 26905 | 12572 | 5708 | 291 | 530 | 143 | 246 | 19490 | 7415 | 10 |
| | | | | | | | | | | | | | | | |

| Serial No. of District | Division/District | Tree Biomass Fuels Resources includes (Forest, Homestead, strip plantation) | Agriculture Land includes Biomass Fuels Resources from crops like (rice, wheat, pulses etc.) | Livestock Biomass Fuels Resources includes (cattle, buffalo, poultry) | Waste Sector includes (MSW, Industrial wastes Sewage Sludge and so on) | Total Supply 7=3+4+5 | Rural Cooking 8 | Urban Cooking 9 | Rice Parboiling 10 | Brick Kiln 11 | Rural Agro 12 | Urban Commercial units 13 | Total Demand/Consumption 13=8+9+10+11+12 | Total Excess (Supply-Demand) 14=(7-13) | Rank of biomass fuels in terms of excess (District wise) 15 |
|------------------------|-----------------------------|---|--|---|--|-------------------------|--------------------|--------------------|-----------------------|------------------|------------------|------------------------------|---|---|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7=3+4+5 | 8 | 9 | 10 | 11 | 12 | 13 | 13=8+9+10+11+12 | 14=(7-13) | 15 |
| | (4) Khulna Division | | | | | | | | | | | | | | |
| 35 | Bagerhat | 3926 | 6607 | 1679 | 0 | 12212 | 5082 | 2459 | 121 | 90 | 60 | 101 | 7912 | 4299 | 9 |
| 36 | Chuadanga | 1812 | 29271 | 1180 | 0 | 32262 | 3966 | 1904 | 99 | 245 | 530 | 77 | 6820 | 25442 | 1 |
| 37 | Jashore | 5963 | 19102 | 3170 | 0 | 28235 | 9449 | 4761 | 307 | 476 | 45 | 189 | 15227 | 13009 | 4 |
| 38 | Jhenaidah | 4887 | 18474 | 2339 | 0 | 25700 | 6056 | 2937 | 227 | 275 | 440 | 121 | 10056 | 15644 | 2 |
| 39 | Khulna | 3929 | 8786 | 1540 | 0 | 14256 | 7812 | 3465 | 156 | 394 | 8 | 159 | 11994 | 2262 | 10 |
| 40 | Kushtia | 6191 | 16822 | 2738 | 0 | 25752 | 6872 | 3466 | 155 | 250 | 602 | 133 | 11478 | 14273 | 3 |
| 41 | Magura | 2738 | 10780 | 1128 | 0 | 14646 | 2945 | 1409 | 94 | 97 | 17 | 63 | 4625 | 10021 | 5 |
| 42 | Meherpur | 604 | 9469 | 886 | 0 | 10958 | 2391 | 1189 | 59 | 97 | 44 | 45 | 3825 | 7133 | 7 |
| 43 | Narail | 4851 | 7710 | 783 | 0 | 13345 | 2333 | 1152 | 82 | 66 | 58 | 49 | 3740 | 9605 | 6 |
| 44 | Satkhira | 3977 | 11413 | 1987 | 0 | 17377 | 6753 | 3275 | 193 | 344 | 13 | 136 | 10714 | 6664 | 8 |
| | | | | | | | | | | | | | | | |
| | (5)Rajshahi Division | | | | | | | | | | | | | | |
| 45 | Bogura | 8789 | 27325 | 3912 | 0 | 40027 | 12540 | 5788 | 451 | 616 | 64 | 232 | 19692 | 20335 | 2 |
| 46 | Joypurhat | 912 | 10301 | 1067 | 0 | 12280 | 3468 | 1701 | 195 | 104 | 272 | 63 | 5803 | 6478 | 8 |
| 47 | Naogaon | 6228 | 27302 | 4167 | 0 | 37698 | 9457 | 4838 | 529 | 427 | 71 | 178 | 15500 | 22198 | 1 |
| 48 | Natore | 3487 | 18022 | 1446 | 0 | 22955 | 6098 | 3069 | 166 | 330 | 3786 | 117 | 13565 | 9390 | 5 |
| 49 | Chapai Nawabganj | 5311 | 9362 | 1189 | 0 | 15862 | 5118 | 2497 | 156 | 259 | 352 | 113 | 8495 | 7367 | 6 |
| 50 | Pabna | 3174 | 22731 | 3784 | 0 | 29689 | 8458 | 3805 | 162 | 339 | 575 | 173 | 13512 | 16178 | 3 |
| 51 | Rajshahi | 3482 | 16928 | 2006 | 0 | 22417 | 9065 | 4132 | 213 | 388 | 1539 | 177 | 15514 | 6903 | 7 |
| 52 | Sirajganj | 4530 | 19534 | 4504 | 0 | 28568 | 10305 | 4990 | 259 | 291 | 111 | 212 | 16168 | 12400 | 4 |
| | | | | | | | | | | | | | | | |

| Serial No. of District | Division/District | Tree Biomass Fuels Resources includes (Forest, Homestead, strip plantation) | Agriculture Land includes Biomass Fuels Resources from crops like (rice, wheat, pulses etc.) | Livestock Biomass Fuels Resources includes (cattle, buffalo, poultry) | Waste Sector includes (MSW, Industrial wastes Sewage Sludge and so on) | Total Supply | Rural Cooking | Urban Cooking | Rice Parboiling | Brick Kiln | Rural Agro | Urban Commercial units | Total Demand/Consumption | Total Excess (Supply-Demand) | Rank of biomass fuels in terms of excess (District wise) |
|------------------------|-----------------------------|---|--|---|--|----------------|---------------|---------------|-----------------|------------|------------|------------------------|--------------------------|------------------------------|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7=3+4+5 | 8 | 9 | 10 | 11 | 12 | 13 | 13=8+9+10+11+12 | 14=(7-13) | 15 |
| | (6) Rangpur Division | | | | | | | | | | | | | | |
| 53 | Dinajpur | 3991 | 50543 | 4423 | 0 | 58957 | 8636 | 6866 | 480 | 382 | 350 | 268 | 16982 | 41975 | 1 |
| 54 | Gaibandha | 3775 | 18612 | 3248 | 0 | 25634 | 7474 | 6079 | 254 | 316 | 330 | 213 | 14666 | 10969 | 7 |
| 55 | Kurigram | 3926 | 15038 | 2678 | 0 | 21643 | 6199 | 5000 | 215 | 207 | 20 | 186 | 11826 | 9816 | 8 |
| 56 | Lalmohirhat | 3926 | 17385 | 2108 | 0 | 23419 | 3536 | 2825 | 151 | 95 | 8 | 113 | 6727 | 16692 | 3 |
| 57 | Nilphamari | 3926 | 17941 | 3133 | 0 | 25000 | 5101 | 3981 | 216 | 153 | 10 | 164 | 9626 | 15375 | 5 |
| 58 | Panchagarh | 3926 | 14305 | 1316 | 0 | 19547 | 2782 | 2244 | 138 | 61 | 477 | 89 | 5790 | 13756 | 6 |
| 59 | Rangpur | 3931 | 25493 | 3428 | 0 | 32852 | 8753 | 6990 | 342 | 428 | 422 | 258 | 17193 | 15659 | 4 |
| 60 | Thakurgaon | 3926 | 24475 | 2366 | 0 | 30766 | 3905 | 3152 | 213 | 142 | 549 | 125 | 8086 | 22680 | 2 |
| | (7) Sylhet Division | | | | | | | | | | | | | | |
| 61 | Habiganj | 3926 | 14631 | 2150 | 0 | 20707 | 5673 | 2494 | 250 | 194 | 634 | 143 | 9388 | 11319 | 1 |
| 62 | Moulvibazar | 3928 | 8508 | 1368 | 0 | 13804 | 5201 | 2079 | 190 | 141 | 1546 | 131 | 9288 | 4516 | 4 |
| 63 | Sunamganj | 3926 | 13064 | 1886 | 0 | 18875 | 6397 | 3038 | 274 | 48 | 8 | 169 | 9934 | 8941 | 2 |
| 64 | Sylhet | 3926 | 11272 | 2760 | 0 | 17958 | 8588 | 2437 | 231 | 226 | 226 | 235 | 11943 | 6015 | 3 |
| Total | | 244379 | 862112 | 126417 | 0 | 1232908 | 427695 | 201386 | 11816 | 19655 | 15825 | 11156 | 687533 | 545375 | |
| Total (percent) | | 19.8 | 69.93 | 10.25 | | 100 | 62.2 | 29.3 | 1.7 | 2.9 | 2.3 | 1.6 | 100 | 79 | |

Compiled by Utpal Bhattacharjee

Figure 8.2: District wise Biomass fuels Supply in TJ (2015)

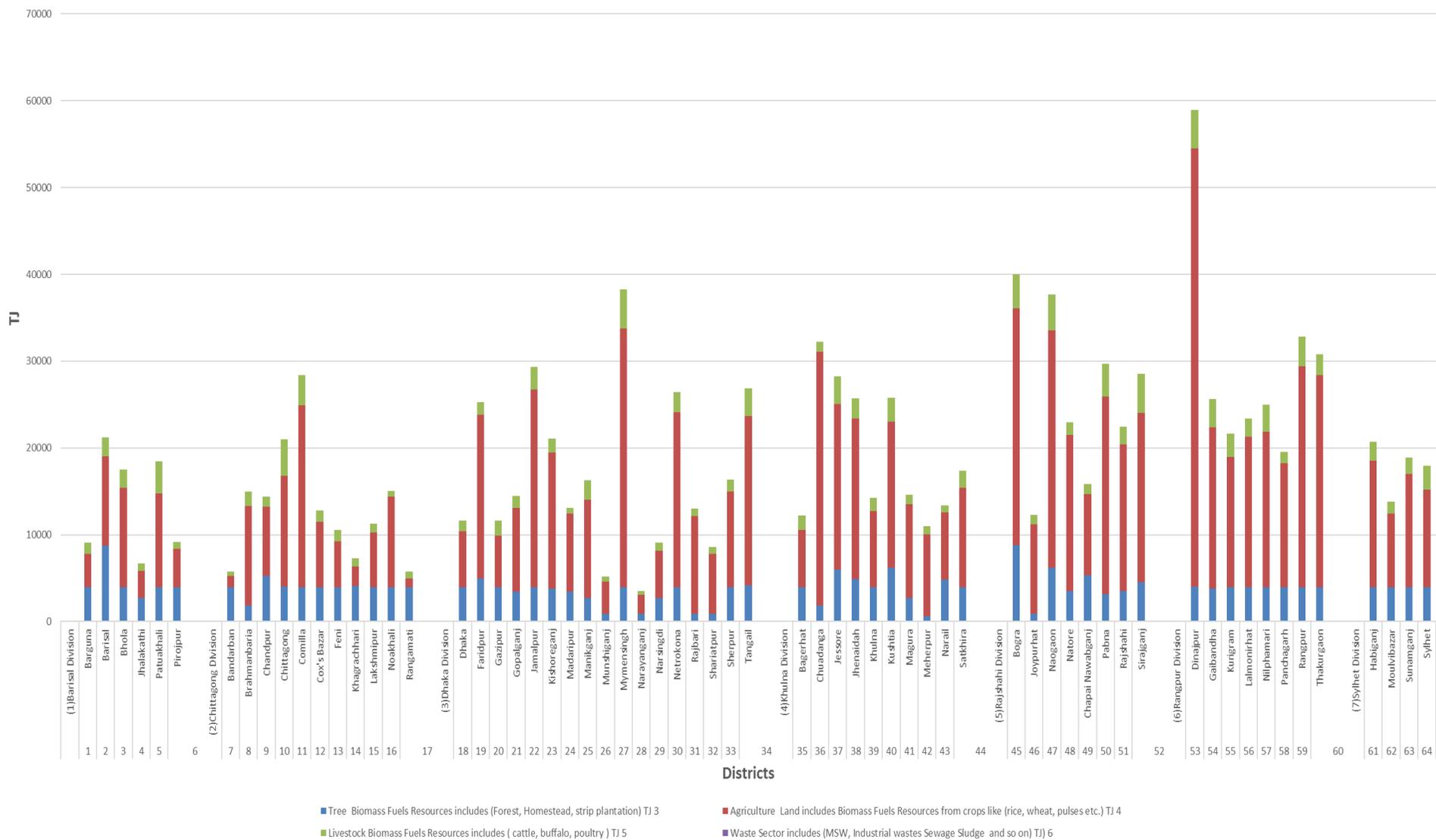


Figure 8.3: Districtwise Consumption of Biomass Fuels in TJ (2015)

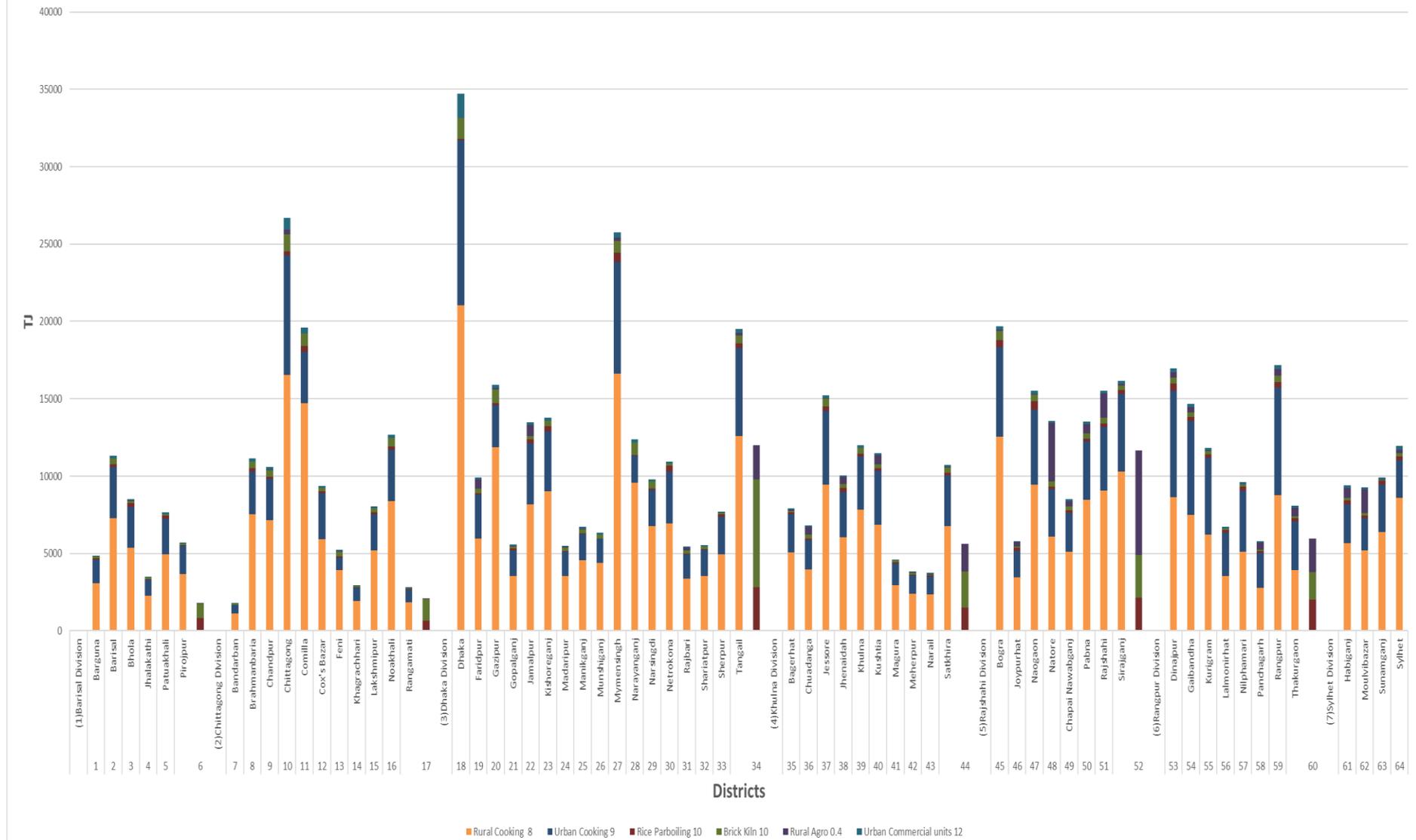


Figure 8.4: Status of Excess Biomass Fuels Supply According to Districts in TJ (2015)

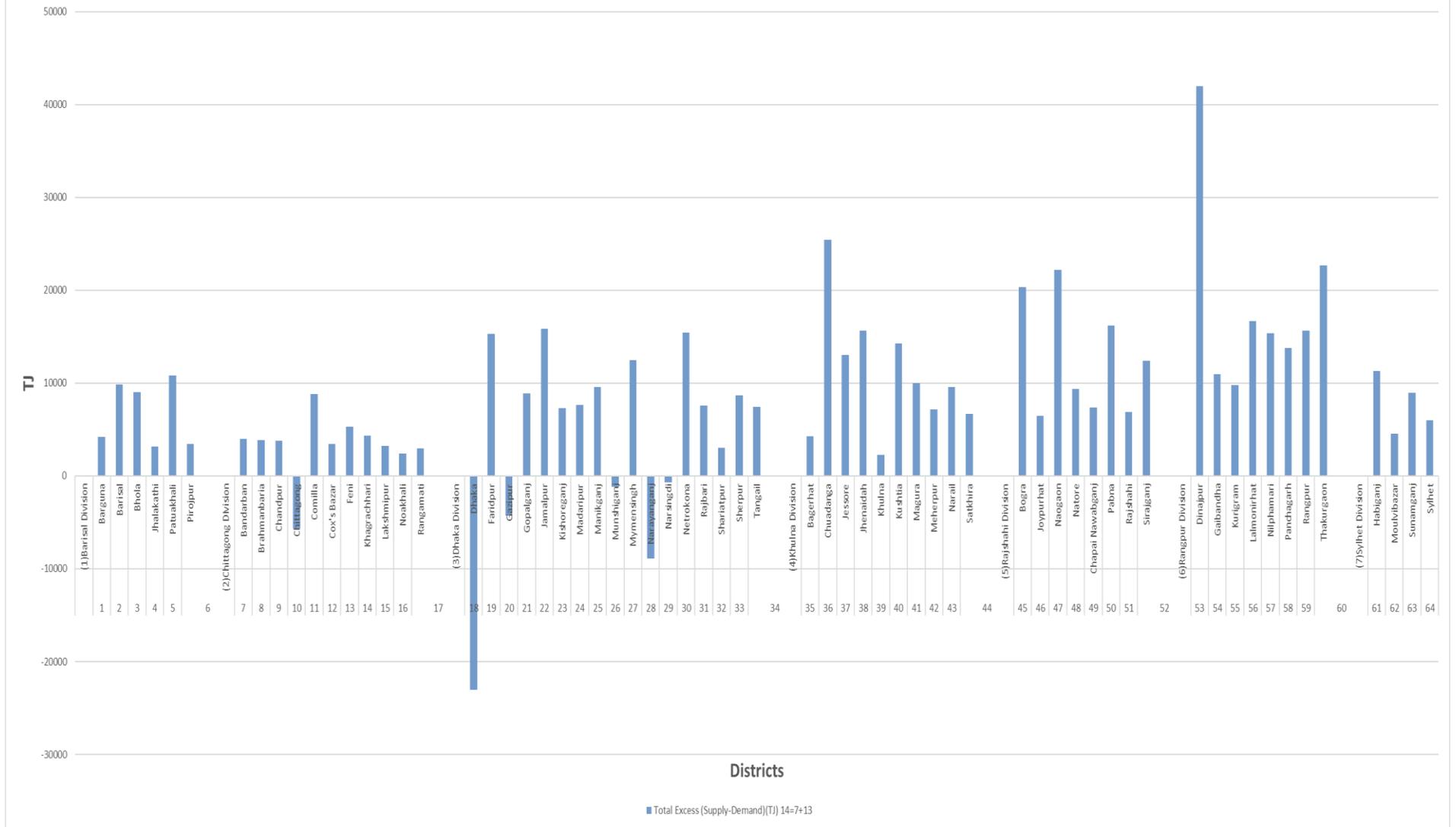


Table: 8.3: Districts Identified with Excess Biomass Fuels Supply in TJ (2015)

| Serial No. of District | Division/District | Tree Biomass Fuels Resources includes (Forest, Homestead, strip plantation) | Agriculture Land includes Biomass Fuels Resources from crops like (rice, wheat, pulses etc.) | Livestock Biomass Fuels Resources includes (cattle, buffalo, poultry) | Waste Sector includes (MSW, Industrial wastes Sewage Sludge and so on) | Total Supply 7=3+4+5 | Rural Cooking | Urban Cooking | Rice Parboiling | Brick Kiln | Rural Agro | Urban Commercial units | Total Demand/Consumption 13=8+9+10+11+12 | Total Excess (Supply-Demand) 14=7-13 | Rank of biomass fuels in terms of excess (District wise) |
|------------------------|------------------------------|---|--|---|--|-------------------------|---------------|---------------|-----------------|------------|------------|------------------------|---|---|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7=3+4+5 | 8 | 9 | 10 | 11 | 12 | 13 | 13=8+9+10+11+12 | 14=7-13 | 15 |
| | (1) Barishal Division | | | | | | | | | | | | | | |
| 2 | Barishal | 8759 | 10244 | 2175 | 0 | 21178 | 7273 | 3336 | 166 | 358 | 22 | 159 | 11314 | 9865 | 2 |
| 5 | Patuakhali | 3929 | 10832 | 3682 | 0 | 18443 | 4929 | 2319 | 187 | 114 | 0 | 105 | 7654 | 10789 | 1 |
| | (3) Dhaka Division | | | | | | | | | | | | | | |
| 19 | Faridpur | 4990 | 18810 | 1461 | 0 | 25261 | 5973 | 2820 | 85 | 296 | 624 | 131 | 9929 | 15333 | 3 |
| 22 | Jamalpur | 3926 | 22798 | 2605 | 0 | 29329 | 8166 | 3968 | 250 | 191 | 746 | 157 | 13478 | 15851 | 1 |
| 30 | Netrokona | 3926 | 20173 | 2307 | 0 | 26406 | 6922 | 3379 | 387 | 98 | 2 | 152 | 10940 | 15467 | 2 |
| | (4) Khulna Division | | | | | | | | | | | | | | |
| 36 | Chuadanga | 1812 | 29271 | 1180 | 0 | 32262 | 3966 | 1904 | 99 | 245 | 530 | 77 | 6820 | 25442 | 1 |
| 38 | Jhenaidah | 4887 | 18474 | 2339 | 0 | 25700 | 6056 | 2937 | 227 | 275 | 440 | 121 | 10056 | 15644 | 2 |
| 40 | Kushtia | 6191 | 16822 | 2738 | 0 | 25752 | 6872 | 3466 | 155 | 250 | 602 | 133 | 11478 | 14273 | 3 |
| | (5) Rajshahi Division | | | | | | | | | | | | | | |
| 45 | Bogura | 8789 | 27325 | 3912 | 0 | 40027 | 12540 | 5788 | 451 | 616 | 64 | 232 | 19692 | 20335 | 2 |
| 47 | Naogaon | 6228 | 27302 | 4167 | 0 | 37698 | 9457 | 4838 | 529 | 427 | 71 | 178 | 15500 | 22198 | 1 |
| 50 | Pabna | 3174 | 22731 | 3784 | 0 | 29689 | 8458 | 3805 | 162 | 339 | 575 | 173 | 13512 | 16178 | 3 |
| | (6) Rangpur | | | | | | | | | | | | | | |

| Serial No. of District | Division/District | Tree Biomass Fuels Resources includes (Forest, Homestead, strip plantation) | Agriculture Land includes Biomass Fuels Resources from crops like (rice, wheat, pulses etc.) | Livestock Biomass Fuels Resources includes (cattle, buffalo, poultry) | Waste Sector includes (MSW, Industrial wastes Sewage Sludge and so on) | Total Supply | Rural Cooking | Urban Cooking | Rice Parboiling | Brick Kiln | Rural Agro | Urban Commercial units | Total Demand/Consumption | Total Excess (Supply-Demand) | Rank of biomass fuels in terms of excess (District wise) |
|------------------------|----------------------------|---|--|--|--|--------------|---------------|---------------|-----------------|------------|------------|------------------------|--------------------------|------------------------------|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7=3+4+5 | 8 | 9 | 10 | 11 | 12 | 13 | 13=8+9+10+11+12 | 14=7-13 | 15 |
| | Division | | | | | | | | | | | | | | |
| 53 | Dinajpur | 3991 | 50543 | 4423 | 0 | 58957 | 8636 | 6866 | 480 | 382 | 350 | 268 | 16982 | 41975 | 1 |
| 56 | Lalmonirhat | 3926 | 17385 | 2108 | 0 | 23419 | 3536 | 2825 | 151 | 95 | 8 | 113 | 6727 | 16692 | 3 |
| 60 | Thakurgaon | 3926 | 24475 | 2366 | 0 | 30766 | 3905 | 3152 | 213 | 142 | 549 | 125 | 8086 | 22680 | 2 |
| | (7) Sylhet Division | | | | | | | | | | | | | | |
| 61 | Habiganj | 3926 | 14631 | 2150 | 0 | 20707 | 5673 | 2494 | 250 | 194 | 634 | 143 | 9388 | 11319 | 1 |

Figure 8.5: Excess Availability of Biomass Fuels (TJ) in the Identified Districts

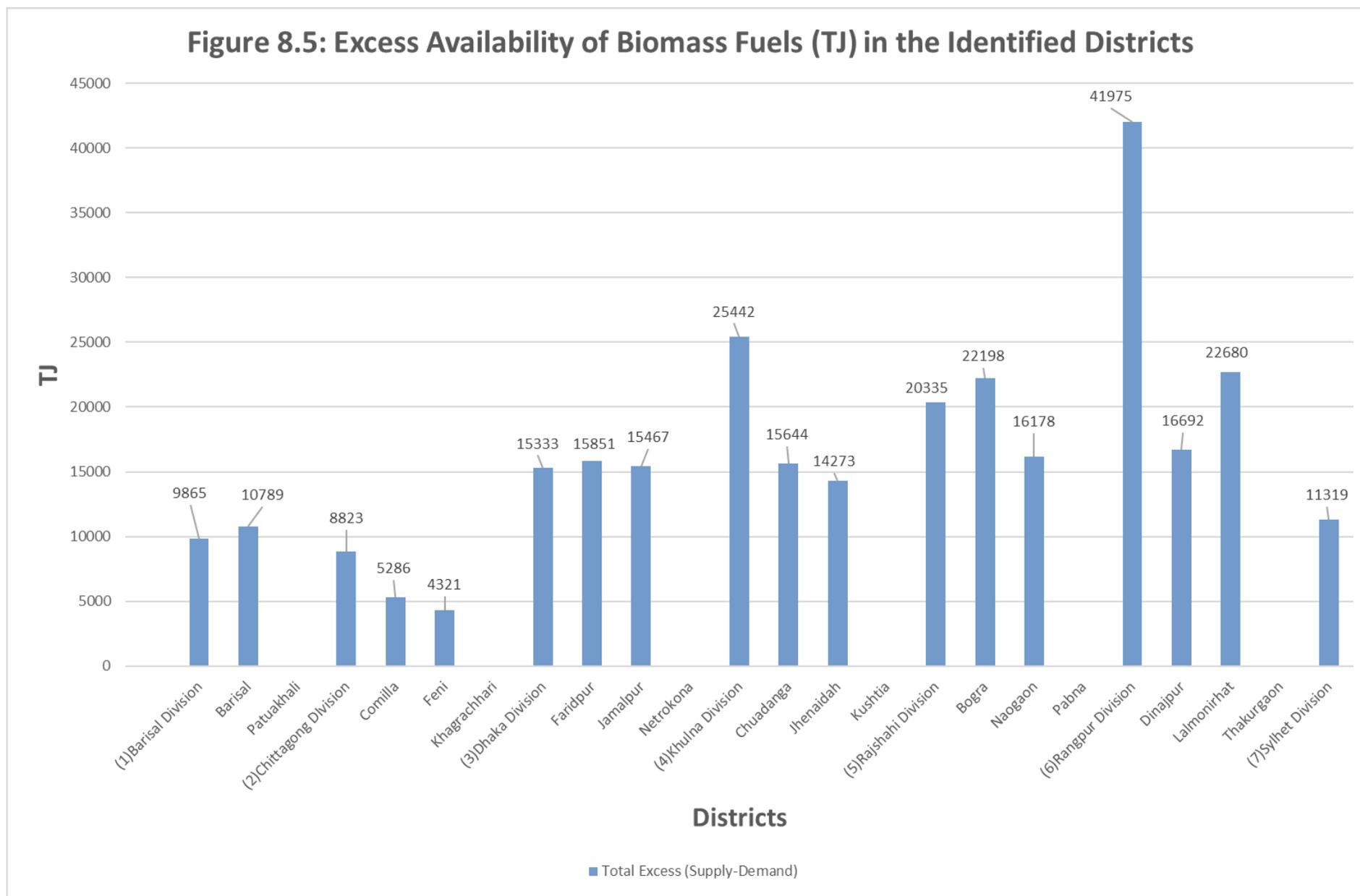
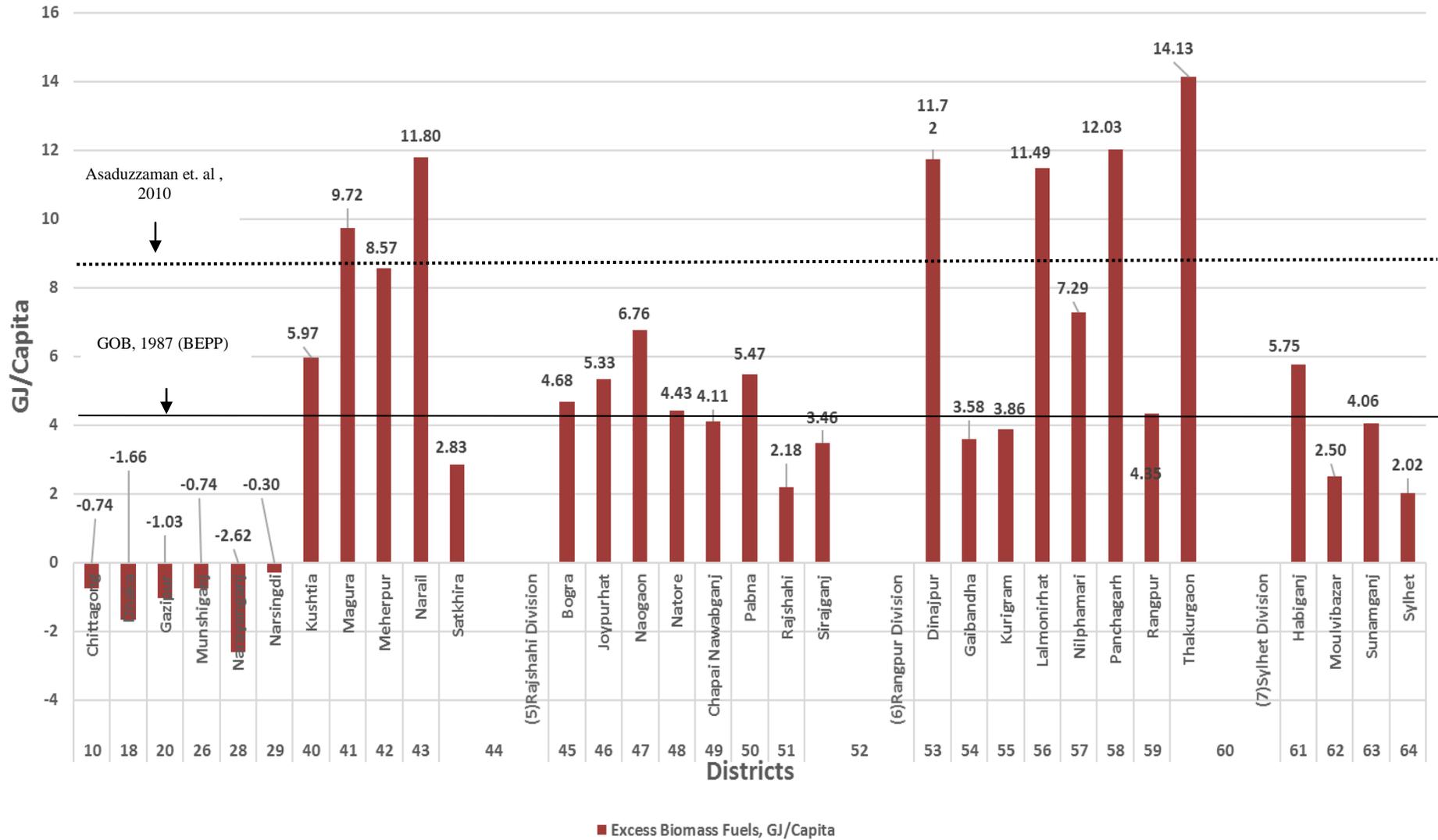


Figure 8.6: Per Capita Biomass Fuels Deficit (GJ/Capita) in the Districts with Deficit



8.6 Comparison with Previous Studies

Bangladesh Energy Study (BES) estimated the supply of traditional fuels (biomass fuels) in 1974 as 20 million tons. In subsequent years, BBS continued publishing the data of traditional fuels in Statistical Yearbooks. The supply of biomass fuels in 1992 was reported as 25.2 million tons, whereas in 1993, BBS published the data of supply of traditional fuels as 44 million tons and continued publishing the data up to 2005, as 51.2 million tons. BBS has not given any explanations for abrupt change of values of supply of traditional fuels between 1992 and 1993. Published data of BBS data have been presented in Figure 8.7 (and partially presented in Figure 1.6 of Component 1). Two scenario lines have been drawn on the plot to indicate BBS data.

Total consumption of biomass fuels in 2015 estimated by the present study was 687,533 TJ (51.3 million tons) and the value is shown in Figure 8.7. It may be noted that estimated consumption of biomass fuels in 2015 is closer to high scenario supply data BBS.

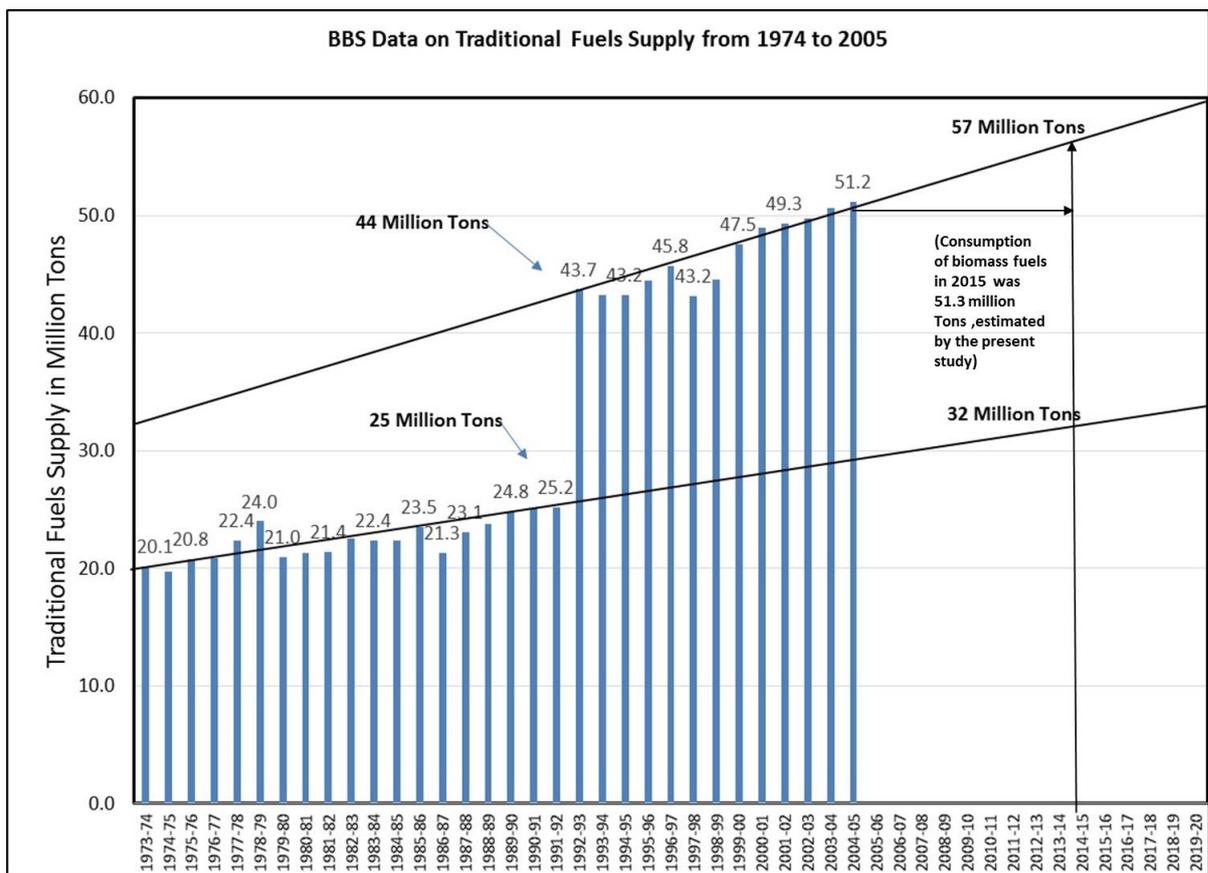


Figure 8.7: BBS Data on Traditional Fuels Supply from 1973- 74 to 2004- 2005 Compared with Consumption of Biomass Fuels Estimated by Present Study.

Total supply of biomass residues from different sources has been estimated as follows: tree residues (16.18 million tons), agricultural residues (111 million tons), animal dung (dry) (10.9 million tons). It means total biomass fuels in year 2015 was estimated as 138 million tons.

Agricultural residues have two major components: plant residues and crop residues. There are multiple uses of plant residues (e.g. straw, stalks and sticks etc.) such as fodder, building

materials and fuels. Crop residues (e.g. bran, oil cake etc.) are generally used as cattle and poultry feed. Rice husk also has multiple uses like poultry bedding materials and fuels.

Respective users grade plant and crop residues according to their economic value to their household. Fodder, feed and building materials are higher value usages than fuel. It means to an individual owner if there is opportunity to use available residues for higher value product, they will not be used for lower valued usage (fuel). Considering these, local practices in mind, supply of crop residues except rice husk has not been made in estimating supply of biomass fuels. For estimating the supply of biomass fuels, supply of plant residues and husk have been made and the total supply was estimated as 111 million tons.

On the basis of experiences of field visits and discussions with users and experts, per capita requirement of straw as fodder has been assumed as 4.5 kg per day per cattle. This value has been used by the present study to compute the total requirement of plant residues for 23.6 million cattle as 39 million tonnes [4.5 kg/day x 365x 23.6 million cattle/1000] per year. Considering fodder as a higher-value use in comparison to fuel, 39 million tonnes (35%) agricultural residues has been set aside as cattle feed and balance quantity of 72 million tons (65%) has been considered as biomass fuels. It may be noted that in addition to allocated plant residues, crop residues and byproducts obtained from fruits and vegetables are also used as animal fodder.

Quantities of biomass residues available as fuel in 2015 were as follows: tree residues 16.18 million tons, agricultural residues 72 million tons and cattle dung (dry) 10.9 million tons; in total biomass residues available as fuels was 99 million tons. It may be noted that consumption of biomass fuels in 2015 was estimated in Component 7 as 51.3 million tons; which means there was 47.7 million tons (99-51.3) excess biomass fuels in whole Bangladesh. District wise balances are to be shown in heat units (TJ), because the consumption was estimated in heat unit. As MSW is not generally used as fuels, this has not been considered in the supply-demand balance of biomass fuels. However, possibility of using wastes materials to generate electricity via biogas has been estimated in Component 6.

Supply of different type of biomass fuels is shown in Table 8.4. Composition of supply of biomass fuels in 2015 estimated by the present study in heat units were as follows: tree residues 19.8%, agricultural residues 69.9% and dung 10.2%.

Comparison of compositions of biomass fuels estimated by different studies are shown in Table 8.5. It may be noted that there are similarities in compositions of biomass fuels estimated by BES (GOB 1976), BEPP (GOB 1987) and the present study. Those three studies indicated that higher proportion (more than 60 percent) of biomass fuels was supplied by agricultural residues, which are compatible to the land use of Bangladesh. However, the compositions of biomass fuels estimated by Asaduzzaman et.al. 2010 was different, which shows higher proportion (58.94 percent) of biomass fuels from trees and 21.94 percent from agricultural residues. Land use analyses have been discussed in Component 2 and Component 4 that in 2015, according to land use analysis forest area covered 17.46 percent and net cropped area covered 53.73 percent of total land area.

Table 8.4: Supply of Different Type of Biomass Fuels Estimated by the Present Study.

| Composition | Weight | | Heat | |
|-----------------------|---------------|-----------|---------|-----------|
| | (million ton) | (Percent) | (TJ) | (Percent) |
| 1 | 2 | 3 | 4 | 5 |
| Tree residues | 16.18 | 16.34% | 244379 | 19.8% |
| Agricultural residues | 72 | 72.72% | 862112 | 69.9% |
| Cattle residues | 10.9 | 11% | 126417 | 10.2% |
| Total | 99 | 100% | 1232908 | 100% |

Compiled by: Utpal Bhattacharjee

Table 8.5: Comparison of Compositions of Biomass Fuels Estimated by Different Studies

| Reference | percent | | | | Remarks |
|-------------------------|---------|----------------------|-----------------|-------|-------------|
| | Tree | Agriculture Residues | Animal Residues | Total | |
| 1 | 2 | 3 | 4 | 5 | 6 |
| GOB 1976 | 12.5 | 62.5 | 25.0 | 100 | Supply |
| GOB 1987 | 10.28 | 66.66 | 23.06 | 100 | Consumption |
| Asaduzzaman et al. 2010 | 58.94 | 21.94 | 19.10 | 100 | Consumption |
| Present Study | 19.8 | 69.9 | 10.2 | 100 | Supply |

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8.7 Projections

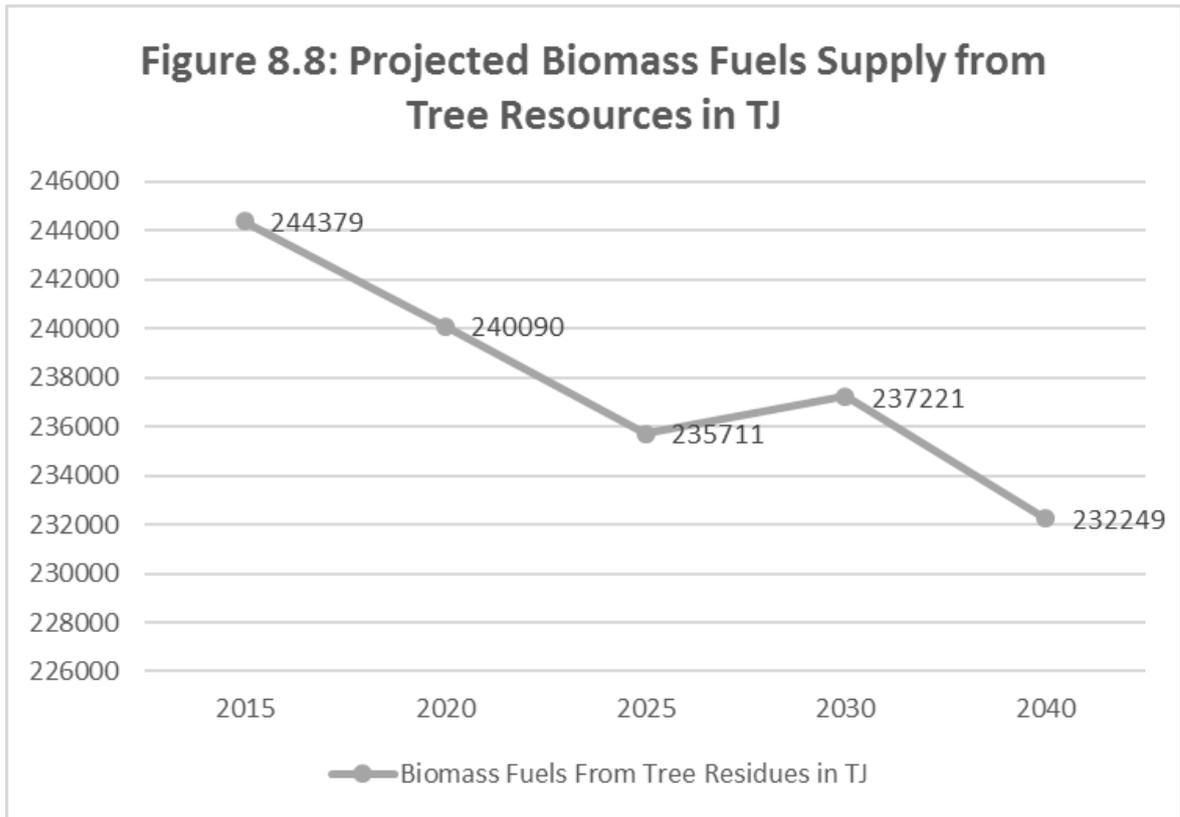
Projections of supplies of different types of biomass fuels (tree residues, agricultural residues, dung and poultry litter and MSW and industrial wastes etc.) and demand of biomass fuels according to Districts have been presented in the reports of the respective components. Considering the large volume of data and uncertainties to estimate future situations, it is decided to make projections of supply and demand of biomass fuels for years 2020, 2025, 2030 and 2040 at the country level. Summary of observations of the Projections are presented below.

- Projections on Tree Residues in Bangladesh in heat unit (TJ) is shown in Figure 8.8; supply of tree residues as fuel will decline.
- Projections on Biomass Fuels Supply from Agriculture Sector in heat unit (TJ) is shown in Figure 8.9; projections of supply of agricultural products and thereby agricultural residues were not available in Government publications
- Projections on Biomass Fuels Supply from Cattles in heat unit (TJ) is shown in Figure 8.10; projection of supply of animal residues has been made by trend analysis.
- Projections of Supply of Biomass Fuels from MSW of Bangladesh in heat unit (TJ) is shown in Figure 8.11. It shows an increase in supply proportion to population growth. Prospects of using MSW in power generation required further research and study.
- Projections of Supply and Demand of Biomass Fuels of Bangladesh in TJ is shown in Figure 8.12 and in Table 8.6. It may be observed that the excess supply of biomass fuels (from agricultural residues) will continue.

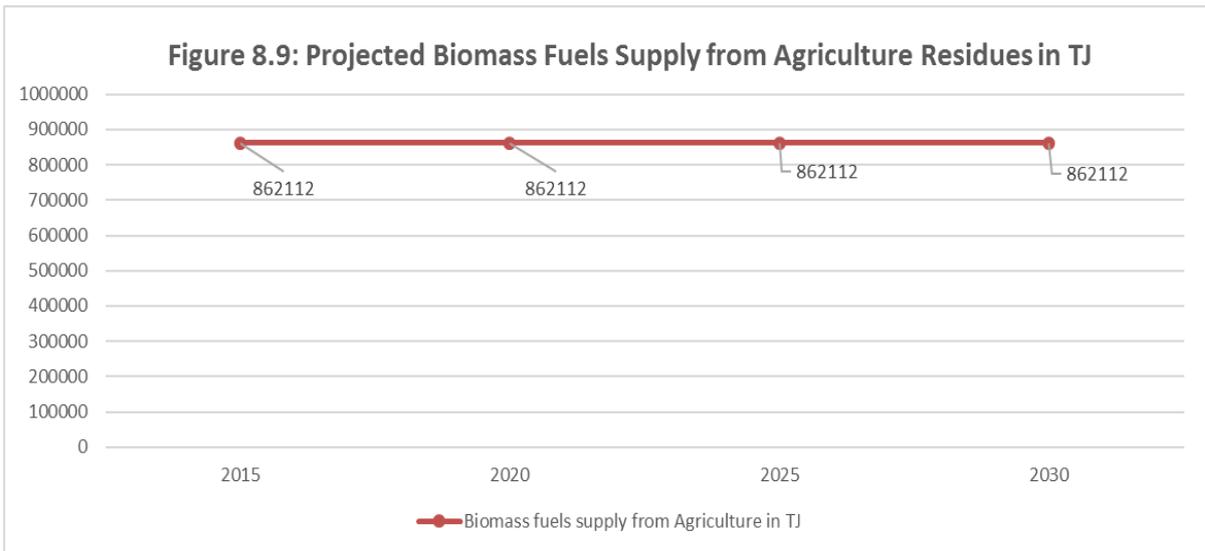
Biomass fuels are land based byproducts obtained from main products (e.g. crops, timber, milk, meat, egg etc.), because of high population density there is limited scope to increase the supply of biomass fuels in future years.

On the other hand, due to socio economic improvement penetration of LPG may result in further availability of excess supply of biomass fuels.

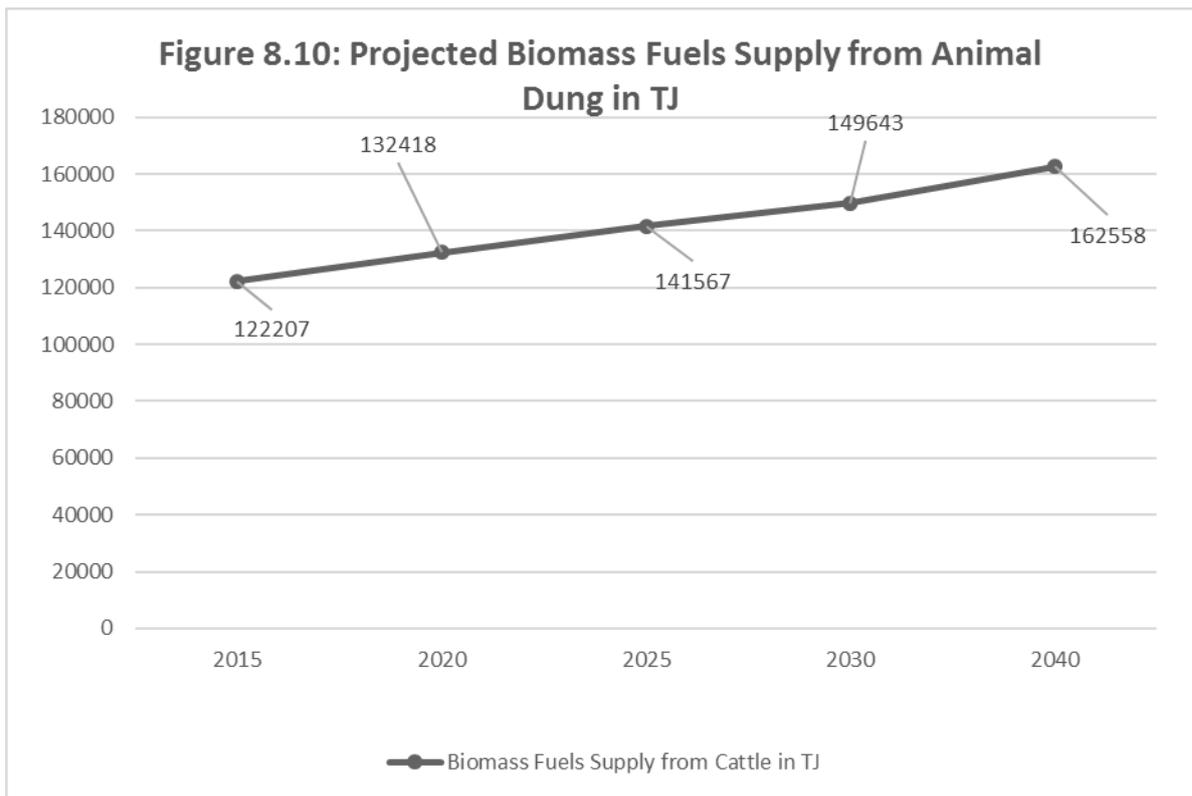
Tree Resources



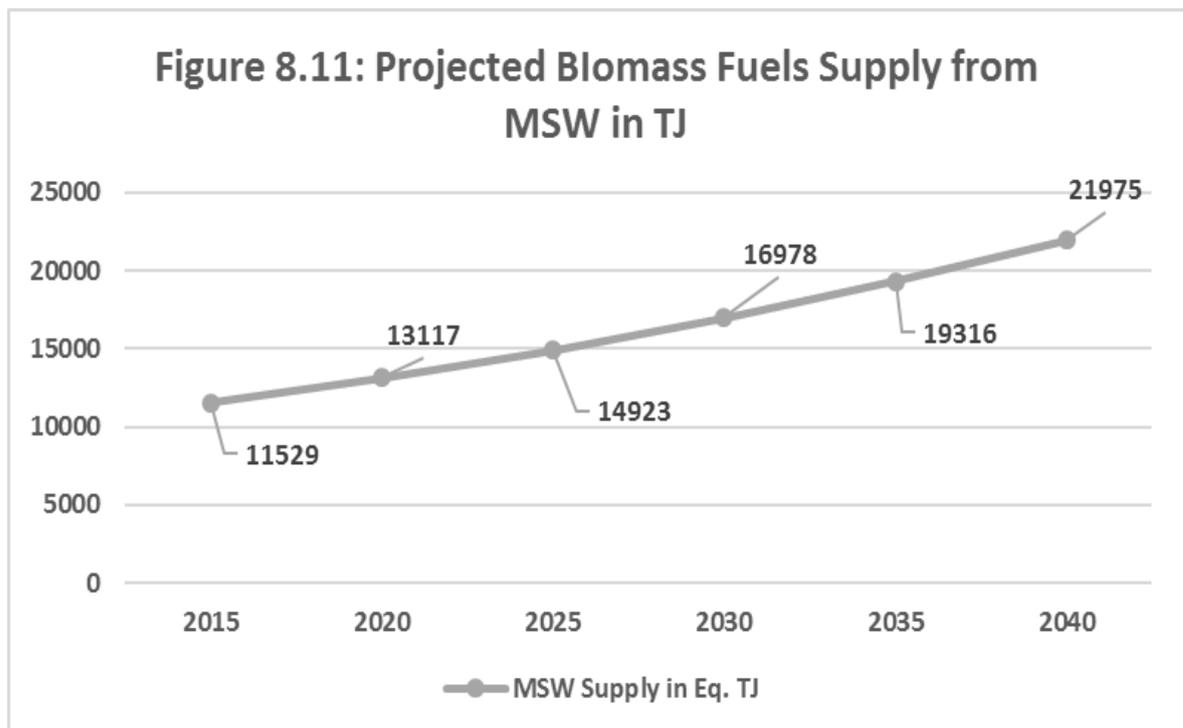
Agriculture Sector



Livestock Sector



Wastes Sector



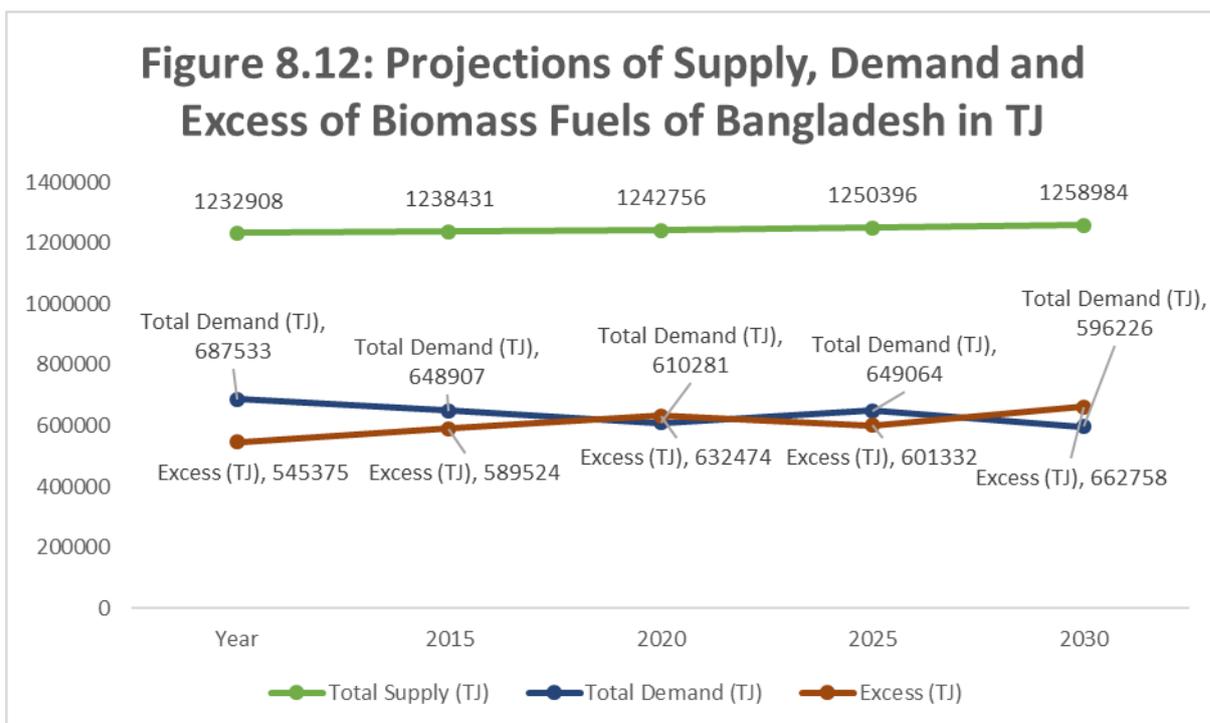


Table 8.6: Supply-Demand-Excess of Biomass Fuels in the Projected Years

| Particulars | 2015 | 2020 | 2025 | 2030 | 2040 |
|---------------------|---------|---------|---------|---------|---------|
| Tree Resources (TJ) | 244379 | 240090 | 235711 | 235711 | 232249 |
| Agriculture (TJ) | 862112 | 862112 | 862112 | 862112 | 862112 |
| Livestock (TJ) | 126417 | 136229 | 144933 | 152573 | 164623 |
| Wastes (TJ) | 11529 | 13117 | 14923 | 16978 | 21975 |
| Total Supply (TJ) | 1244437 | 1251548 | 1257679 | 1267374 | 1280959 |
| Total Demand (TJ) | 687533 | 648907 | 610281 | 649064 | 596226 |
| Excess (TJ) | 556905 | 602641 | 647397 | 618310 | 684733 |

8.8 Biomass Fuels Action Plan (BFAP)

Introduction

The present study has been supported by Sustainable and Renewable Development Authority (SREDA), an organization under the Power Division of the Ministry of Power, Energy and Mineral Resources (MoPEMR). On the basis of the data gathered by the above seven components, supply and demand balance of biomass fuels are to be established for 64 districts. Potential districts for biomass fuels based power generation are to be identified and ten sites (as per ToR) are to be selected for establishing biomass fuel based power generation (pilot plants).

Overall objective of the present study is to make a Comprehensive Assessment of the Availability and Use of Biomass Fuels for Various End Uses with Special Attention to Power Generation. The study is mandated to (i) assess the availability of biomass fuels (ii) assess the use of biomass fuels (iii) assess the prospects of power generation.

Background Information

It has been discussed that the availability of biomass fuels depends on the land use pattern of the country. Analyses of data indicated that the compositions of biomass fuels supplied in 2015 were: tree residues (19.8%), agricultural residues (69.9%), and animal residues (10.2%), MSW & industrial wastes has not been considered in heat balance. The following Ministries are responsible for planning and development of supply side of biomass fuels. Ministry of Environment Forest and Climate Change-Tree Residues, Ministry of Agriculture-Agricultural Residues and Ministry of Fisheries and Livestock- Animal Residues, Ministry of Local Government and Cooperative- MSW, Ministry of Industries- Industrial Wastes. SREDA has no direct responsibility towards action plans related to supply of different biomass fuels. Even the respective line Ministries would pay attention to sustainable development of main products, not byproducts.

Ministry of Power, Energy and Mineral Resources (MoPEMR) is responsible for planning and development of commercial energy sources (e.g. coal, oil and natural gas) and power (e.g. renewable energy and commercial energy based power). It has been discussed in Component 1, that the distribution of commercial energy sources and biomass fuels in 2015 in TPES were 64% and 36% respectively. MoPEMR is responsible for the supply and management of 64% of total primary commercial energy sources of the country. No organization is responsible for planning and development of the rest 36 percent of primary energy sources (biomass fuels).

Analyses of past data of supply of TPES indicated that the share of biomass fuels in TPES in 1976 was about 70 percent, which has gradually decreased to 36 percent in 2015. Total biomass fuel consumption in 2015 was estimated as 51.3 million tonnes of which 90% is used for domestic cooking. Considering 10% efficiency of biomass fuel cookstoves, if it is replaced by petroleum fuel for cooking (50% efficiency), it would require about 2.98 million tonnes of liquid fuel. In 2018-19, Bangladesh imported total 6.7 million tons of petroleum fuels at a cost of \$4.8 billion (the Daily star, 28 September 2018). Accordingly, the contribution of biomass fuel in country's economy would have been about US\$ 2.13 billion. It may be noted that substitution of 47.8 million tons (90% of 51.3 million tons of biomass fuels) of biomass fuels used for cooking with hydrocarbon fuel (e.g. LPG) would contribute a net CO² emission of 39.13 million tonnes $[(47.8 \times 10^6 \times 47.7 \times 17.20) / 10^3]$ in the atmosphere (IPCC, 1996).

It may be further noted that, extensive use of biomass fuels for cooking saved a significant emission that otherwise would have been emitted if we had to use hydrocarbon fuel like LPG to meet the same cooking demand. Moreover, if we add this saved emission due to biomass fuels use (carbon neutral fuel) to our total country CO₂ emission of 152 million tonnes, reported in the Third National Communication of Bangladesh (GOB, 2018) based on 2012 baseline, the total emission would have reached to 189.88 (152+37.88) million tonnes of

CO₂. The increased emission would have contributed to an increase of per capita emission, which was 0.98 tonne CO₂/person (2012) to 1.22 tonnes CO₂/person (189.88/155.7). Bangladesh Government has taken an unconditional CO₂ emission reduction target (5% below 2012 emission baseline) in its Nationally Determined Contribution (NDC) (GOB, 2015) under Paris Agreement. This resulted in a CO₂ emission reduction target of 7.6 million tons (5% of 152 million tons of CO₂ emission) on Bangladesh to achieve it by the year 2030. The efficiency improvement of existing Improved Cookstoves (ICS) models will not only help achieving our NDC GHG emission reduction target but will also help reducing pressure on National Economy to import expensive hydrocarbon based fossil fuel like LPG to meet our cooking demand in a sustainable manner. Special attention required to enhance the pace of ICS dissemination target taken in the Country Action Plan (CAP) to promote ICS as a clean and GHG emission free cooking solution for the population of Bangladesh.

Biomass Fuel Projects of SREDA

SREDA established in 2014 is mandated to promote energy efficiency and renewable energy in the country. SREDA has prepared an Energy Conservation Masterplan up to the year 2030. SREDA has two active Programs related to sustainable development of biomass fuels. They are Country Action Plan (CAP) on Clean Cook stoves and Promotion of Biogas Technology for Energy. It is reported that different organizations has reported to have disseminated about 5 million ICS. The impacts of CAP on saving of biomass fuels for cooking are yet to be assessed. Clean Cooking Alliance (CCA) has initiated the process to update the CAP up to 2030. Under the guidance of SREDA, a national committee has prepared the Guidelines on Biogas Technology for Energy.

It would be necessary to maintain the Centralised Database of all installed biogas plants (domestic and large size) and Improved Cookstoves for monitoring of previous and ongoing projects and for the planning of future projects on biogas technology and Improved Cookstoves.

It is envisaged that the outputs of the present study would facilitate both the above mentioned projects to decide appropriate strategies for Biomass Fuel Action Program, which are presented below.

Improved Cookstove Program

CAP program of SREDA can use district wise data base on supply and demand balance of biomass fuels in deciding appropriate strategies for the districts having negative biomass fuel balance (biomass fuels scarcity) and excess supply of biomass fuels.

Biogas Based Electricity Generation

Total number of Biogas Plant may be considered for electricity generation has been listed in Table 8.7. Following observations may be made on the basis of data, presented in the Table

(1) Biogas based electricity generation potential in 10 Government owned livestock farms with 6059 cattle has the potential to generate biogas 3,817 cubic meter per day,

which may be used to generate 5,464 kWh of electricity per day. If the generators are operated for 8 hours a day, it would require generation capacity of 683 kW.

(2) Total amount biogas may be generated in 47 (forty seven) privately owned large cattle farms registered with dairy association of Bangladesh with 7,923 cattle has the potential to generate biogas 7,330 cubic meter per day, which may be used to generate electricity 11,694 kWh per day. If the generators are operated for 8 hours a day, it would require generation capacity of 1,462 kW.

(3) Total amount biogas may be generated in 64,073 privately owned small cattle farms with 640,073 cattle has the potential to generate biogas 400,334 cubic meter per day, which may be used to generate 5,72,952 kWh of electricity per day. If the generators are operated for 8 hours a day, it would require generation capacity of 71,619 kW (about 72 MW) in 64 districts

(4) Total amount biogas may be generated in 760 privately owned poultry farms with 76,00000 birds has the potential to generate biogas 22,522 cubic meter per day, which may be used to generate 32,215 kWh of electricity per day. If the generators are operated for 8 hours a day, it would require generation capacity of 4,027 kW (about 4 MW) in 64 districts.

Among the above mentioned four groups of beneficiaries, 10 Government farms may be selected on priority basis for implementation of pilot project. Investment requirement for this 10 Government Farms have been estimated in Table 8.8 (Taka 74.23 million).

At the next stage, SREDA may consider establishing biogas plants for the rest three groups shown in Table 8.6 (privately owned registered dairy farms, small dairy farms and poultry farms). Feasibility studies are to be undertaken to implement those projects. Policy recommendations mentioned in Guidelines on Biogas Technology for Energy may be given due consideration.

It is recommended that at the initial stage SREDA should pay attention to generation of electricity by using Biogas Technology. In subsequent stage by further analyses of the data of the present study, SREDA may consider other biomass to energy conversion technologies for heat and electricity generation (e.g. combined heat and power).

Table 8.7: Biogas Potential for Electricity Generation

| Particulars | Number of units | Number of animals | Biogas generation (cubic meter per day) | Electricity Generation (kWh/day) | Generation Capacity (kW) |
|------------------|-----------------|-------------------|---|----------------------------------|--------------------------|
| 1 | 2 | 3 | 4 | 6 | 7 |
| Government Farms | 10 | 6,059 | 3,817 | 5,464 | 683 |
| Dairy Farms | 47 | 7,923 | 7,330 | 11,694 | 1,462 |
| Small Farms | 64073 | 6,40,730 | 400,554 | 572,952 | 71,619 |
| Poultry Farms | 760 | 76,00,000 | 22,522 | 32,215 | 4,027 |
| Total | 64,890 | 13,982 | 434223 | 622,325 | 77,791 |

Compiled by Utpal Bhattacharjee

Table 8.8: Estimated Costs of Pilot Biogas Plants for Power Generation in 10 Government Owned Livestock Farms

In Taka

| Sl. No | Districts | Number of cattle | Potential biogas Production (Cubic meter/day) | Generator capacity @ 8 hours operation/day (kW) | Industry Standard Reference Taka/Cubic Meter | Cost of biogas system | Cost of Generators | Total Cost | |
|--------------|------------|------------------|---|---|--|-----------------------|--------------------|-------------------|--|
| 1 | 3 | 4 | 5 | 6 | 7 | 8=5*15000 | 9 | 10 | |
| 1 | Dhaka | 1642 | 985 | 176 | 15000 | 15000000 | 3600000 | 18600000 | |
| 2 | Sylhet | 161 | 97 | 17 | | 1500000 | 900000 | 2400000 | |
| 3 | Faridpur | 141 | 85 | 15 | | 1500000 | 900000 | 2400000 | |
| 4 | Bagerhat | 613 | 548 | 98 | | 8220000 | 1800000 | 10020000 | |
| 5 | Chottogram | 118 | 71 | 13 | | 1065000 | 450000 | 1515000 | |
| 6 | Bogura. | 196 | 118 | 21 | | 1800000 | 900000 | 2700000 | |
| 7 | Rajshahi | 363 | 218 | 39 | | 3300000 | 1300000 | 4600000 | |
| 8 | Barishal | 158 | 95 | 17 | | 1500000 | 900000 | 2400000 | |
| 9 | Dhaka | 2000 | 1200 | 215 | | 18000000 | 4050000 | 22050000 | |
| 10 | Dhaka | 667 | 400 | 72 | | 6000000 | 1550000 | 7550000 | |
| Total | | | | | | | | 74,235,000 | |

Compiled by: Utpal Bhattacharjee

8.9 Conclusion & Suggestions

For the first time in Bangladesh supply and demand of biomass fuels have been estimated according to districts for the base year 2015 and projected as follows: 2020, 2025, 2030 and 2040.

- Composition of the total supply of biomass fuels have been estimated as 99 million tons and the shares of tree residues, agriculture residues and animal dung are as follows: tree residues 19.8 percent, agriculture residues 69.9 percent, animal dung 10.2 percent.
- It has been identified that the following districts have negative balance of biomass fuels: **Chattogram, Dhaka, Gazipur, Munsiganj, Narayanganj** and **Narsingdhi**.
- It has been identified that the following districts have excess supply of biomass fuels: **Barishal, Faridpur, Jamalpur, Netrokona, Chuadanga, Jhenaidah, Kusthia, Bogura, Naogaon, Pabna, Dinajpur, Lalmonirhat, Thakurgaon and Habiganj**. District level data of excess supply of biomass fuels are to be further analysed at Upazila level to identify the locations for establishing biomass based power plants.
- SREDA may consider in sending a multidisciplinary team of experts to visit the districts identified as deficit and excess supply of biomass fuels in rainy season to assess the practical situation of biomass availability.
- Availability of plant residues from Aush Paddy should be estimated at Upazila/Union level to identify the location for biogas based power generation units.
- Biogas based electricity generation potential in 10 Government owned livestock farms may be considered on priority basis to generate electricity. Potential installed capacity of these power plants may be 683 kW considering 8 hours of average plant running time. Total electricity generation potential has been estimated as 5,464 kWh. A Feasibility studies should be undertaken to assess the size and locations of biogas plants within the Farms.
- Biogas based electricity generation potential in 47 Private livestock farms, registered with Dairy Associations may be considered to generate electricity on priority basis. Potential installed capacity of these power plants may be 1,462 kW considering 8 hours of average plant operation time. Total electricity generation potential has been estimated as 11,694 kWh. A Feasibility studies should be undertaken to assess the size and locations of biogas plants within the Farms.
- Biogas based electricity generation potential in 64,073 private livestock farms according to districts have been estimated. Potential installed capacity of these power plants may be 71,619 kW considering 8 hours of average plant operation time. Total electricity generation potential has been estimated as 5,72,952 kWh. A Feasibility studies should be undertaken to assess the size and locations of biogas plants within the Farms.
- Biogas based electricity generation potential in 760 private Poultry farms according to districts have been estimated. Potential installed capacity of these power plants may be 4,072 kW considering 8 hours of average plant operation time. Total electricity

generation potential has been estimated as 32,215 kWh. A Feasibility studies should be undertaken to assess the size and locations of biogas plants within the Farms.

- Municipal solid wastes based power plants may be established in six Municipalities identified in the SREDA study on waste to electricity generation. Both Co-firing and Digestors technologies may be considered for power generation.
- Practical Action Bangladesh has established four MSW based biogas plants in some Municipalities. Possibility for application of these technologies in large size biogas plants should be considered.

A huge quantity of data on supply and demand of biomass fuels have been gathered and analyzed in this project. SREDA should undertake necessary measures in assigning the management, updating and publication of biomass fuels database to a competent national institution with good historical record of biomass fuels research.

8.10 Acknowledgements

I duly acknowledge assignment reviewer, Dr. M. Nurul Islam for his valuable guidance and direction to complete this component. Through our continuous interaction and sittings, I was able to develop the necessary concepts to complete this invaluable part which is the supply-demand balance of biomass fuels of the country along with projections of different biomass fuels up to the year 2040.

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APPENDIX- VIII

Table VIII.I: List of Biogas Plants for Electricity Generation Financed by IDCOL

| Sl. No | Project | Project Cost (BDT) | Plant Capacity (cum) | Capacity (kW) | Commercial Operation |
|--------|--|--------------------|---|---------------|----------------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | Rashid Krishi Khamar Ltd. Raimony, Trishal Mymensingh | 43,67,251 | 221.04m ³ | 50 | June 2010 |
| 2 | Phenix Agro Ltd. Member Bari Gazipur | 11,36,55,500 | 350m ³ x 5 Digester = 1750m ³ | 400 | June 2013 |
| 3 | Kazi and Kazi Tea Estate Ltd. Rowshanpur Tetulia, Panchagarh | 3,57,12,226 | 300m ³ | 64 | December 2015 |
| 4 | Zubaida Poultry Ltd. Shashanpara | 8461,664 | 280m ³ (2x140m ³) | 25 | November 2015 |
| 5 | Umami Kulsum Agro Ltd., Bhusapur Tangail | 1,17,74,418 | 210m ³ = (3 x 70m ³) | 25 | October 2014 |
| 6 | United Integrated Agro Ltd. Bangahati, Sreerpur | 2,50,33,750 | 500 m ³ (2x 250m ³) | 60 | April 2016 |
| 7 | Dewan Poultry Ltd. Bhawal, Gazipur | 18,64,357 | 40m ³ | 6 | May 2012 |
| 9 | Razib Poultry Ltd. Bhawal, Gazipur | | 40m ³ | 6 | May 2012 |
| 9 | Al Shishir Poultry Ltd. Bhawal, Gazipur | | 40m ³ | 6 | May 2012 |

Source: IDCOL 2019



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