In Nepal, the share of biomass in total energy consumption is about 88 % and of biomass for cooking and heating about 90 % in 76 % of the households. Fuelwood, crop residues and dung are the three main biomass types. The lack of an integrated biomass inventory is hindering the formulation of effective policies and programs for sustainable resource management. This study evaluates the spatial variation of biomass supply and demand for cooking and heating in Nepalese rural households in three districts representing the country’s main topographic regions lowland, hills, and mountains. The analysis is based on information from household survey, field studies, laboratory analyses, national statistics and application of GIS. Only those households adopting at least one type of biomass for cooking and heating are considered. The household survey was conducted in 240 households to evaluate biomass consumption, whereas the use of crop residues and dung is assessed in field studies in 27 households for the three seasons in 2013/14. By considering the five main staple crops (paddy, wheat, corn, millet and barley), the residues were evaluated, while cattle and buffalo were taken as a basis to assess the dung. The residue-to-product ratio (RPR) is the evaluation basis of crop residue supply, while the dung supply was assessed by determining the daily dung yield. The supply module of the GIS-based wood fuel supply and demand model (WISDOM) was taken as reference for the estimation of the fuelwood supply.

The annual per capita demand of biomass (dry matter) in terms of “fuelwood equivalent” in the lowland, hill and mountain districts is 435 kg, 660 kg, and 653 kg, respectively, where of the households only 57 %, (lowland district), 50 % (hill district) and 3 % (mountain district) have a surplus biomass supply. The fuelwood equivalent of crop residues (1 kg DM), dung (1 kg DM), LPG (1 kg) and biogas (1 m3) are 0.40 kg, 0.93 kg, 23 kg and 4.57 kg, respectively. The households in the mountain district only use fuelwood whereas multiple energy sources with different combinations exist in the hill and lowland districts. The average annual per capita dung (dry matter) supply potential is 262 kg (lowland district), 278 kg (hill district) and 93 kg (mountain district). Despite the higher crop residue (dry matter) production (954 kg capita-1 yr-1) in the lowland than in the hill (547 kg capita-1 yr-1) district, the net usable amount of crop residues for energy generation is observed to be higher in the hill (207 kg capita-1 yr-1) than in the lowland (152 kg capita-1 yr-1) district. The lowest production (263 kg capita-1 yr-1) of crop residues was observed in the mountain district of which only 10 % is available for energy production.

Because of the relatively easier accessibility of forests in the hills and mountains, the households there do not burn crop residues or dung for energy production, and here the fuelwood exploitation rate is three times higher than the production potential. The fuelwood exploitation rate in the lowland district is double the production potential where about 66 % of the households utilize crop residues and dung for energy generation. The fuelwood deficit is the main reason for the use of crop residues and dung in the lowland district. The primary focus there should be on converting crop residues with bio-briquettes and dung with biogas. Awareness programs to prevent overexploitation of fuelwood by making balanced use of biomass should be initiated in all regions, while the use of other herbaceous materials for bio-briquettes and dung of small ruminants for biogas production should be initiated to fill the biomass supply gap in the mountains. Given the highly uneven distribution of biomass in all districts, the transportation of biomass from surplus to deficit areas could be one of the potential solutions to reduce overexploitation of fuelwood.