

Comparative Analysis of Living Energy in Rural Areas of Tibet and Sichuan

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Abstract: This article conducted a survey of the pastoral areas of Naqu City, Tibet, Shigatse City, Tibet, rural areas of Linzhi City, Tibet, and rural areas of Heishui County, Sichuan. Due to the basically same lifestyle, the energy needs of rural farmers and herdsmen households are mainly used for cooking, heating, and household appliances, but are affected by different natural resources, climatic environments, and geographical locations enjoyed by different regions, This has led to differences in the proportion of energy demand in three aspects across regions, and there are significant differences between Tibet and Sichuan in terms of energy source methods.

Keywords: Rural Tibet, Rural Sichuan, Daily energy consumption, Comparative analysis.

1. Introduction

The rapid development of the global economy and the intensification of the industrialization process have led to an increasingly depleted situation of traditional energy reserves, and the rapid consumption of traditional energy has also made the global ecological environment unbearable. It is urgent to vigorously develop clean and renewable energy[1]. Tibet is located in the southwest of the Qinghai-Tibet Plateau in China. Its special geographical location and climatic conditions provide Tibet with abundant clean energy resources such as hydropower, solar energy, geothermal energy, and wind energy, which gives Tibet a huge advantage in the development and utilization of renewable energy. At the same time, vigorously developing and utilizing clean energy in Tibet is of great significance to implementing the national energy development strategy and serving the economic and social development and long-term stability of Tibet[2].

According to the research in this paper, both pastoral areas

(Naqu area), agricultural areas (Shigatse area) and resource rich areas (Nyingchi area) in Tibet, and farming pastoral areas (Heishui county area) in Sichuan Tibetan area, because of the basically same lifestyle, the energy demand of rural farmers and herdsmen households is mainly used for cooking, heating and household appliances, but is affected by different natural resources, climate and environment The impact of different geographical locations has led to different proportions of energy demand in three areas in different regions. However, there are significant differences in energy sources within and outside the region, as shown in Table 1. Except for the Linzhi region, where the climate is too humid and wood resources are abundant, which results in its main energy source being fuelwood, the main energy sources in the Naqu region, Shigatse region, and Heishui county regions are cow and sheep dung. In terms of the secondary energy sources, the Heishui county region is hydropower, which belongs to clean energy, compared to the coal Liquefied gas from Shigatse and Linzhi is more sustainable and clean.

Table 1. Differences in energy source modes between Tibet and Sichuan in different regions

Number	Area	Properties	Primary	Secondary	Subsidiary
1	Naqu	Pastoral area	Cow dung	Coal	Agriculture, animal husbandry and electricity
2	Xigaze	Crop growing areas	Cow and sheep dung	Liquefied gas and agricultural and livestock electricity	Solar energy
3	Lin Zhi	Resource rich area	Fuelwood	Liquid gas	Hydropower
4	Heishui	Agriculture and animal husbandry integration area	Cow and sheep dung	Water, electricity and fuelwood	Liquid gas

2. Comparative Analysis of Energy Consumption

In order to effectively carry out comparative analysis of energy use, typical farmers and herdsmen households located in different regions but with similar average income levels and household per capita annual income levels were selected for example in different regions of Tibet and Sichuan Tibetan regions. In Tibet: The pastoral area selects the Sorang

Wangdai family in Jiagong Village, Luoma Town, Seni District, Naqu City, with a per capita annual income of about 12000 yuan; The agricultural area is the Basang family in Jirong Village, Zhaxigang Township, Lazi County, Shigatse City, with a per capita annual income of about 13500 yuan; The resource rich region selects the Cidan Zhuoma family in Zharao Township, Milin County, Linzhi City, with a per capita annual income of about 12500 yuan. The Sichuan Tibetan region selects the Zhaxi Ciren family in Xisu Guazi Village,

Weigu Township, Heishui County, Aba Tibetan and Qiang Autonomous Prefecture, with a per capita annual income of about 13000 yuan. By converting their household annual energy consumption into standard coal for accounting and comparison, as shown in Figure 1.

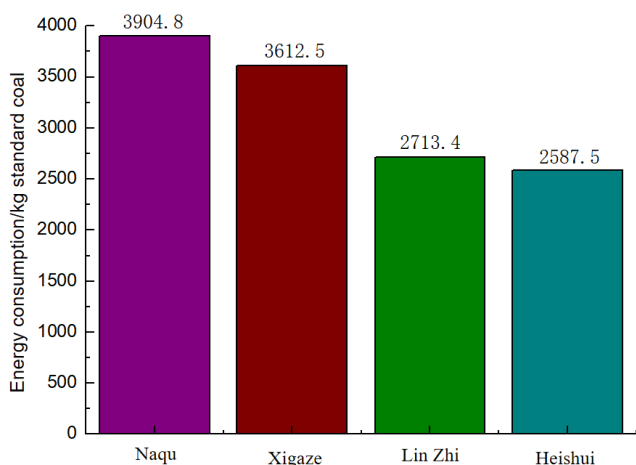


Figure 1. Comparison of annual energy consumption of farmers and herdsman's households inside and outside Tibet

From Figure 1, it can be seen that under the condition of similar per capita annual income levels of households, there are significant differences in the annual energy consumption of farmers and herdsman's households in different regions of Tibet and outside the region. For example, the annual energy consumption of the Sorang Wangdui family in the Naqu pastoral area in the region is 1.44 times that of the Cidan Zhuoma family in the Linzhi region, and 1.51 times that of the Zhaxi Ciren family in the Heishui county region; The annual energy consumption of the Basang family in the Shigatse agricultural area is 1.4 times that of the Zhaxi Ciren family in the Heishui County area; The annual energy consumption of the Cidan Zhuoma family in Linzhi Prefecture is 1.05 times that of the Zhaxi Ciren family in Heishui County. To sum up, the annual energy consumption of farmers and herdsman's households in pastoral, agricultural, and resource rich areas in Tibet investigated is greater than that in Tibetan areas outside the region. This is mainly due to the following reasons: 1. The duration of winter cold and winter periods in Naqu and Shigatse regions of Tibet is longer, and the duration of extreme low temperature weather is long. Residents in agricultural and pastoral areas consume more energy for heating in winter; 2. In Tibet, the self-sufficient energy of farmers and herdsman's households is basically only cow and sheep dung, and its combustion calorific value is not high. Therefore, when heating and cooking are urgently needed, it is only supplied through fossil energy, so the consumption of fossil energy (coal, liquefied gas, etc.) accounts for a large proportion, as shown in Figure 2; "Compared to outside Tibet, farmers and herdsman's households in Tibet have insufficient coverage of the power grid, and their power supply cannot be effectively guaranteed. Therefore, the proportion of electricity consumption is relatively small, especially for clean electricity such as solar power and hydropower, as shown in Figure 3." However, both within and outside Tibet, the utilization rate of renewable energy such as solar energy and wind energy by rural farmers and herdsman is generally low, and the comprehensive utilization rate of "nearby materials" is relatively low.

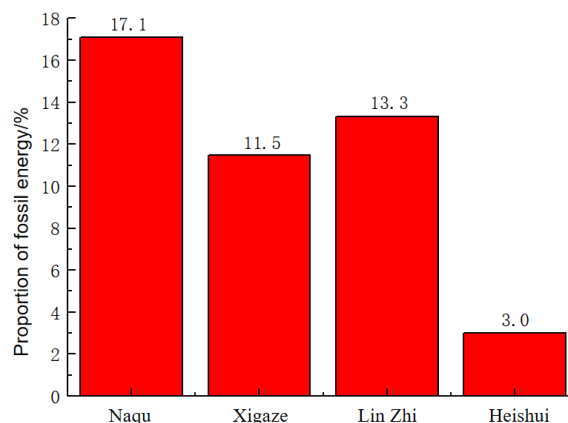


Figure 2. Proportion of fossil energy

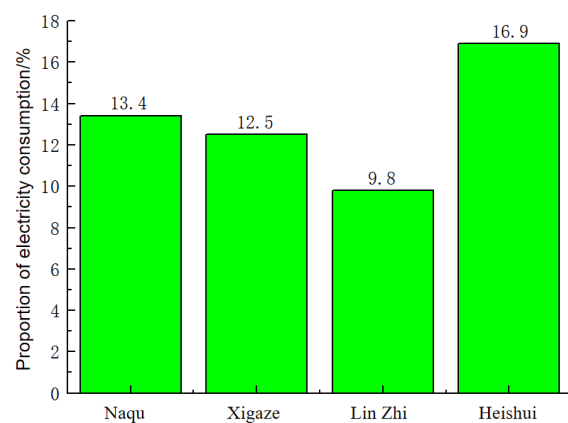


Figure 3. Proportion of electric energy

Due to the similar cultural environment of the selected research sites, the main energy source in Nyingchi region is cattle and sheep dung, except for fuel wood. Therefore, the annual consumption of cattle and sheep dung and fuel wood by farmers and herdsman in and outside Tibet region is converted into standard coal for quantitative accounting and comparison, as shown in Figure 4. Through sorting out and analyzing the survey data, it is found that Luoma Town, Seni District, Naqu City, as a pure pastoral area in Tibet, due to the severe cold in winter, herdsman's households, especially those relocated from other places, are increasingly inclined to purchase coal for winter heating as their economic income level increases, so the comprehensive use of cow dung is not as high as in Shigatse (agricultural area), Most herdsman in pastoral areas collect cow dung and bag it for sale (usually selling it for 7 to 9 yuan per bag) to increase household income.

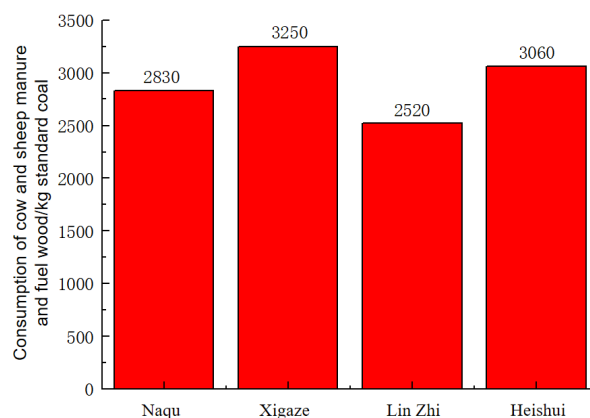


Figure 4. Comparison of Annual Consumption of Cow and Sheep Manure/Fuel Wood

Secondly, the windows of most farmers and herdsmen's houses in Tibet still use ordinary single-layer glass (as shown in Figure 5). Even if the walls of a house are very thick (about 40cm to 50cm), indoor heat will still be emitted through thin windows, which is not conducive to the overall indoor insulation. Therefore, replacing the single-layer glass of the windows of farmers and herdsmen's homes in the region with double-layer insulating glass or thermally colored intelligent glass will greatly improve the indoor thermal insulation effect of farmers and herdsmen's houses, relatively reducing the demand for heating, and is also of great significance for the development of energy-saving buildings in the entire Tibet Autonomous Region.



Figure 5. Windows of Farmers and Herdsmen's Families in Tibet

3. Opinions and Suggestions

(a) Promote replacing coal/salary with electricity. Replacing coal or firewood with electricity is the conversion of industrial boilers, residential heating, cooking, and other uses of coal or firewood to electricity, which can directly reduce emissions of pollutants caused by combustion. Implementing electricity as a substitute for coal/salary can give full play to the advantages of renewable energy in Tibet, promote clean energy use methods such as thermal storage electric heating, geothermal heat pumps, electric water heaters, and electric cookers, and significantly improve air quality[3].

(b) Promote replacing oil with electricity. Replacing oil with electricity means developing electric vehicles to reduce the dependence of traditional vehicles on oil. According to the estimate that the number of motor vehicles in China is expected to exceed 200 million in 2020 and 400 million in 2030, only motor vehicles will consume about 800 million tons of oil per year, which is four times the oil production and 2.8 times the import volume of China in 2012. Tibet's road traffic is in a period of rapid development, with a significant increase in the number of motor vehicles, but the proportion of electric vehicles is still relatively low. The construction of supporting equipment, such as charging piles, also needs to be improved. In theory, replacing oil with electricity can completely replace oil consumption in the transportation sector, boosting the development of green energy[4].

(c) Promote the renewable energy mutual aid mechanism. On the one hand, strengthen the energy mutual aid

cooperation mechanism with neighboring provinces such as Qinghai Province, Sichuan Province, and Gansu Province, based on the energy mutual aid of multiple channels, multiple locations, multiple trading cycles, and multiple trading varieties, to maximize the consumption of surplus electricity during the rainy season and make up for the shortage of electricity during the dry season[5].

4. Conclusion

Through the vigorous development during the "13th Five Year Plan" period, great progress has been made in the development and utilization of energy in Tibet, but it is still difficult to meet the rapid economic and social development in Tibet. The energy issue remains a major issue that plagues the development of Tibet. Due to the unique natural environment in Tibet, it is difficult for the region to develop heavy industry, and the Tibet Autonomous Region cannot absorb abundant renewable energy sources such as hydropower and solar energy. If the region vigorously improves the living energy habits of residents in agricultural and pastoral areas, or converts resource advantages into development advantages, it will inevitably export energy to outside the region on a large scale, which is in line with both the national strategic planning and the development needs of the region itself. However, considering the current consumption dilemma caused by the nationwide electricity surplus, although there is a huge opportunity for the export of renewable energy in Tibet outside the region, it also faces significant challenges and many difficulties.

5. Supported Project Name

"Investigation and comparative analysis of the current situation of rural households' energy use inside and outside the district"

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