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Investigation on the current situation of energy use in pastoral and agricultural areas in Tibet

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Abstract

In view of the current situation of energy use in pastoral and agricultural areas of Tibet, such as single utilization mode and insufficient utilization rate of comprehensive resources, this paper conducts an investigation on the current situation of energy use by rural households in Tibet, grasps the characteristics of energy use by rural households in some areas of Tibet, compares and analyzes the current level and structure of energy use by rural households in some areas of Western Tibet, and discusses the defects and deficiencies in the current situation of energy use by rural households in some areas of Tibet, To provide data support and guidance for rural energy use in pastoral and agricultural areas of Tibet, so as to effectively improve the energy use structure in the Tibetan Plateau and protect the ecological environment of agricultural and pastoral areas.

Keywords

Current energy use; Tibet; Animal husbandry area; Agriculture area.

1. Introduction

Since the successful completion of targeted poverty alleviation and rural revitalization, Tibet's power industry has made rapid progress. However, due to the special climate, geographical location, historical problems and other reasons, the power supply in some parts of Tibet is still unstable. Exploring solutions to the power supply and improving the energy utilization in power deficient areas in Tibet has become a major concern of the Party Central Committee, the State Council and the governments of autonomous regions, The power supply problem in Tibet is not only related to economic development, but also an indicator of political stability. The energy and fuel resources of Tibetan farmers and herdsmen mainly include water, geothermal, solar, wind, straw, firewood, livestock manure and coal. At present, the energy supply of farmers and herdsmen in Tibet is restricted by factors such as uneven regional distribution of energy, poor development conditions, less high-quality energy, difficult energy supply and low overall development and utilization of energy, which makes the daily energy supply of farmers and herdsmen mainly rely on traditional biomass fuels, especially in the shortage of fuel and energy in Tibetan agricultural and pastoral areas. Farmers and herdsmen have always used firewood, cow dung and other biomass energy as fuel.

With the rapid economic growth of the whole Tibet region and the improvement of people's living standards, people's requirements for the quality of life are getting higher and higher, and their demand for energy is also growing gradually. However, due to the scarcity of petroleum, coal and other fossil energy resources in Tibet, and the difficulty in development, the improvement of people's living standards in agricultural and pastoral areas is directly affected [1]. At present, the energy resources and fuel resources of rural households in Tibet mainly include hydropower, solar energy, straw, firewood, livestock dung and coal. There are also problems such as uneven regional distribution of energy, poor development conditions, less high-quality energy, difficult energy supply and low overall development and utilization of

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energy, which not only cause environmental pollution, but also lower living standards [2]. The pastoral areas in Tibet selected in this paper are related villages in Naqu City, and the agricultural areas in Tibet are related villages in Xigaze City. Therefore, through the investigation of the current situation of energy use in the pastoral areas and agricultural areas in Tibet, the purpose of improving the living conditions of farmers and herdsmen in Tibet, protecting the ecological environment in Tibet, helping rural revitalization, and maintaining social stability is achieved.

2. Living and economic conditions

2.1. Relevant information of Naqu area

Naqu City is located in the north of Tibet, the hinterland of the Qinghai Tibet Plateau, and is the source of the Yangtze River, Nujiang River, Lhasa River, Yigong Zangbu and other major rivers. It is the "north gate" of Tibet and an important part of the five major pastoral areas in China. It is known as the "source of rivers" and the "Chinese water tower". It is generally an underdeveloped and backward area. It is located between the Tanggula Mountains, the Nianqing Tanggula Mountains and the Gangdise Mountains in the north of Tibet. The central part belongs to the plateau hilly terrain, the northwest part has a higher altitude, the northern part belongs to the Tanggula Mountain area, the eastern part belongs to the plateau mountains, and the southern part belongs to the intersection zone of the northern Tibetan plateau and the eastern Tibetan mountains and valleys. Naqu area belongs to the sub cold climate zone, with high cold and oxygen deficiency, large temperature difference between day and night, and windy weather. Luoma Town and Xiangmao Township in Seni District of Naqu City were selected as the typical representatives of Tibetan pastoral areas in this survey, and the typical administrative villages were investigated on the spot, as shown in Figure 1. With the help of the staff of Luoma Town, Seni District, Naqu City, 30 questionnaires were distributed in this field survey, and 30 were effectively recovered. The feedback rate was 100%. The total number of effective survey households was 30, involving 148 people.

Fig.1 Site survey photos in Naqu area

For typical pastoral areas in Tibet, Jiagong Village, Luoma Town, Seni District, Naqu City is taken as a typical administrative village for example. Jiagong Village is a pure pastoral area, with 106 households, 503 people and 43 relocated households. The relocation rate is 40.6%. The income of herdsmen mainly comes from: migrant workers, cattle grazing and selling, ecological post subsidies, grassland subsidies, and "one village one integration" dividends. Among them, the migrant work rate of adult males in the village is about 52%, the grassland area is about 350~6000 mu/household, the yak ownership is 20~150 heads/household, and the goat ownership is 18~76 heads/household. The total milk income generated by the "one village one cooperation" through the sale of yaks in the cooperative is about 185000/year. Jiagong Village has achieved comprehensive poverty alleviation, but about 38.4% of the residents with an annual per capita income of less than 10000 yuan, 52.1% of the residents with an annual per capita income of 10000~20000 yuan, and 9.5% of the residents with an annual per capita income of more than 20000 yuan. Therefore, for households in pastoral areas, family income

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mainly comes from migrant workers' income and cattle grazing income. According to the statistics and research data, the income from migrant workers is almost equal to cattle grazing income.

2.2. Relevant information of Xigaze region

Xigaze is located in the southwest of the Qinghai Tibet Plateau, bordering Ali in the west, Naqu in the north, Lhasa and Shannan in the east, and Nepal, Bhutan, India and other countries; The terrain is relatively high in the north and south, between which is the Tibetan Plateau and the Yarlung Zangbo River basin, which is located in the middle of the Himalayas, Gangdise and Nyainqentanglha mountains. The general climatic characteristics of Xigaze area are: thin air, low pressure, and little oxygen; The solar radiation is strong, the sunshine duration is long, the annual average is 3300h, and the ultraviolet radiation on the plateau is strong; The temperature is low, with small annual difference and large daily difference. Rural households in Laxiu Township and Zhaxigang Township, Razi County, Saga County, Xigaze City were selected as typical representatives of household energy use in Tibetan rural areas for this survey, and field surveys were conducted in relevant administrative villages. The photos of field surveys are shown in Figure 2. In this field survey, with the help of the village team, a total of 40 questionnaires were distributed, 35 of which were effectively recovered, with a feedback rate of 87.5%. The total number of effective survey households was 35, involving 179 people.

Fig.2 Site survey photos in Xigaze area

For typical agricultural areas in Tibet, take Jirong Village, Zhaxigang Township, Lazi County, Xigaze City as an example. Jirong Village is a rural area, with a total of 428 people from 83 households and 378 residents from 58 households. Before the land ownership confirmation, the cultivated land area was 1257.86 mu (13000 mu), and the yield per mu was about 450 kg. After the land ownership confirmation and registration, the cultivated land area was 2163.31 mu (2100 mu), and the yield per mu was 480 kg. The grassland area was 13649.85 mu (136600 mu), the river area was 690 mu (70000 mu), the forest area was 300 mu (33000 mu), and the per capita cultivated land area after the land ownership confirmation was 5.11 mu, The main crops are highland barley, rape, potatoes, etc. At present, there are 2235 livestock on hand, including 395 large livestock (heads, heads) and 1840 small livestock (heads).

The per capita annual income of Jirong Village is less than 10000 yuan (28.6%), 10000~20000 yuan (57.1%), and more than 20000 yuan (14.3%). According to the survey results, the main sources of income of Jirong Village are migrant workers and farmers (a few families rely on handwork), and the proportion of adult male migrant workers is as high as 80%. Therefore, compared with pure pastoral areas such as Naqu, the proportion of adult male migrant workers in rural areas such as Xigaze is higher, and the per capita income level of families is higher.

3. Energy use status

3.1. Current situation of energy use in Naqu area

Since the towns and villages in Naqu area belong to pure pastoral areas, which are mainly plateau grassland landforms, the local industry is mainly animal husbandry production, which

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is called alpine pastoral area for short. Because of the high altitude and cold climate in Naqu area, herdsmen have been burning yak dung for cooking, milk and heating for a long time. However, the burning value and heat utilization efficiency of cow dung are low. Therefore, it is necessary to pick up a large amount of yak dung on the grassland, resulting in a serious decline in the soil fertility of the grassland. The longer the grass is, the lower the yield is. As a result, the grassland is degraded and desertification, and the beauty of "cattle and sheep are seen when the grass is low in the wind" is difficult to reappear, The lack of grass in winter and spring caused serious loss of fat and even death of livestock, which caused significant economic losses to herdsmen and seriously affected the process of rural revitalization in Naqu region. Take the energy source amount converted into standard coal amount in Jiagong Village, Luoma Town, Seni District, Naqu City as an example to reflect the proportion of energy source amount in Naqu pastoral area, i.e. the energy proportion, as shown in Figure 3.

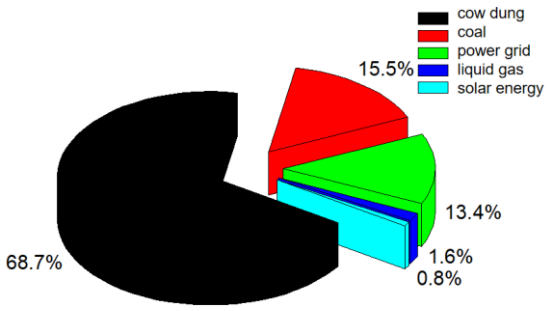

Fig.3 Structure of energy sources in Jiagong Village

According to relevant field research, the energy sources in Naqu region are mainly composed of biomass energy (cow dung accounts for 68.7%), fossil energy (coal accounts for 15.5%) and modern energy (agricultural and livestock electricity accounts for 13.4%, liquefied gas accounts for 1.6%, and solar photovoltaic household system accounts for 0.8%), of which biomass energy mainly comes from the local animal husbandry system's self-sufficiency or independent purchase (relocated households); Fossil energy and modern energy are mainly purchased by themselves or purchased and distributed by relevant government departments (solar photovoltaic household system). The above proportion of energy sources is mainly due to the fact that Naqu area is a pure pastoral area, and herdsmen are accustomed to using cow dung for cooking and heating. The proportion of energy consumption is shown in Figure 4. Naqu area mainly uses energy for cooking and heating, accounting for 79.8% of the total. The average consumption of cow dung per household is about 9000-11000kg/year.

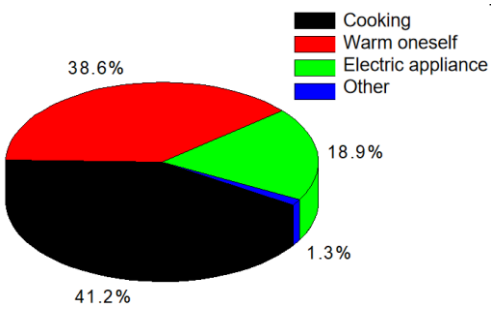

Fig.4 Proportion of energy consumption in Jiagong Village

3.2. Current situation of energy use in Xigaze area

Xigaze area is mainly cultivated land and planted in agricultural areas, and its forage planting industry is mainly composed of green fodder and artificial forage planting, among which green fodder is mainly planted on cultivated land, and the artificial grass planting project is mainly planted through reclamation of wasteland. The two are different in terms of planting land. Forage planting is mainly used to solve the problem of short-term fattening of livestock and

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livestock spending the winter in the dry season in winter. However, there are differences in land use. On the one hand, it is affected by social and economic development; On the other hand, it is because different historical periods put forward different requirements for agricultural economic development. Therefore, compared with the pure pastoral area of Naqu region, there is a certain difference in the current situation of energy use in Xigaze region. Taking Jirong Administrative Village, Zhaxigang Township, Razi County, Xigaze City as an example, the proportion of energy sources in Xigaze agricultural area is reflected by converting energy sources into standard coal, as shown in Figure 5. For many years, the energy source of Jirong Village mainly consists of biomass energy (including livestock manure and straw) and modern energy (mainly including liquefied gas, solar power and solar cooker). The former is mainly self-sufficient through local farming and animal husbandry industry, while the latter mainly relies on self purchase (liquefied gas) or government assistance (solar power supply and solar cooker).

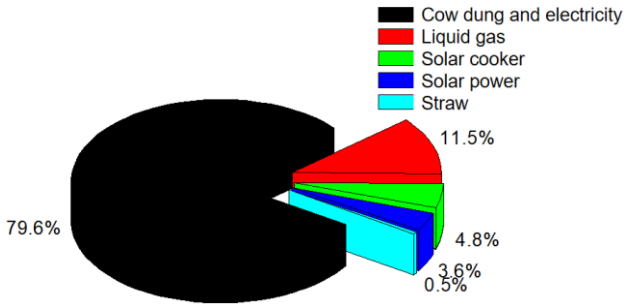

Fig.5 Energy source structure of Jirong Village

According to the survey, the energy sources of Jirong are mainly liquefied gas, cow dung and electricity for farming and animal husbandry, which account for 91.1% of the total energy sources. The average annual consumption of liquefied gas is about 9~12 cans/year (depending on the wealth of the family), and the average consumption of cow dung is about 7500~9500kg/year, and they are mainly used for cooking and heating in winter. The proportion of energy consumption is similar to that of Naqu pastoral area. Other clean energy sources, such as solar power (mainly solar household system) and solar ovens, account for only 8.4% of the total. However, compared with the pure pastoral area of Naqu (0.8%), the utilization rate of renewable energy products has been greatly improved. At present, except for some low-income households who are still burning straw for energy without permission, other farmers and herdsmen households have responded to the government's call and have not burned straw and other pollutants without permission.

4. Analysis of renewable energy utilization optimization scheme

According to the current situation of renewable energy in the agricultural and pastoral areas of Tibet, the available renewable energy utilization optimization schemes mainly include biogas technology scheme, wind energy technology scheme, solar energy technology scheme, etc.

Biogas production refers to the process in which anaerobic microorganisms decompose livestock manure, agricultural straw, meal waste and other organic matters in biogas digesters to produce biogas under anaerobic conditions. It is found that when the fermentation temperature is below 10 ℃, anaerobic microorganisms will stop the anaerobic digestion process, and the biogas yield will also be reduced to 0[3]. Therefore, to ensure stable biogas production, the biogas digester needs to be insulated and warmed when the temperature is low in winter. However, the energy consumption for biogas digester insulation and heating is large, and some intensified heating measures are also uneconomical.

Solar energy technology solutions include photothermal technology, photoelectric technology, photobiological technology and photochemical technology. Some scholars can improve indoor

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temperature in winter and reduce heating energy consumption in winter through the research and setting of active and passive solar rooms [4]. And the photoelectric technology is also gradually becoming mature. At the end of 2013, an office building in Xichang City was able to achieve self-sufficiency in electricity use through the "roof power station", and additional electric energy can be connected to the grid.

The technical scheme of wind energy is mainly to use wind energy for power generation. However, at present, the price of wind energy power generation devices is high, and the efficiency of wind energy power generation alone is low, and the working time is short, so it is generally difficult to meet large power demand.

To sum up, in order to better realize the utilization of renewable energy, we can choose the renewable energy utilization optimization scheme of wind solar complementary off grid power generation. This scheme has the advantages of high power generation efficiency, power stability and long power generation time, as well as the characteristics of improving the utilization rate of renewable energy and improving the energy consumption structure.

Supported project name:

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