



Impacts of renewable energy on gender in rural communities of north-west China



Wenguang Ding^{a,c,*}, Lijun Wang^{b,c}, Baoyu Chen^{a,c}, Luan Xu^{a,c}, Haoxu Li^b

^a MOE Key Laboratory of Western China's Environmental Systems, Collaborative Innovation Centre for Arid Environments and Climate Change, Lanzhou University, Lanzhou 730000, China

^b College of Earth and Environmental Sciences, Lanzhou University, Lanzhou 730000, China

^c Lanzhou University Center for Western Environmental and Social Development, Lanzhou 730000, China

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ABSTRACT

This investigation compares the traditional energy structure with improved energy structures, and evaluates the impact of renewable energy on gender relations in rural communities in north-west China. The traditional energy consumption structure in rural communities in north-west China was based on biomass and coal. However, the improved energy consumption structures consist of renewable energy based on solar energy cookers, biogas digesters and energy saving stoves. Compared with traditional biomass-based energy consumption, renewable energy could significantly improve energy use efficiency and alter women's labour intensity, health status, living standards and even men's share of some cooking tasks. The field investigation data revealed that: women are free from having to collect firewood after integration use of renewable energy including biogas digesters, energy saving biomass stoves and solar energy cookers; the frequency of firewood collection, firewood collection quantity, time spent in firewood collection and human energy consumption of women have greatly decreased when traditional energy consumption structures are improved; using biogas can daily save 50% of cooking time for women; 91% of women use surplus funds from energy saving to buy clothes and cosmetics products; 3.1% of them enjoy travelling; and also use of clean energy devices can further reduce the risk of women exposed to indoor smoke pollution, and hence prevent women from possibly getting respiratory diseases. Therefore, it can be concluded that: gender is an important aspect of energy, which has previously been ignored by many researchers; gender does matter in the area of access to, ways of use, opportunities and control over energy; energy and women are linked in many diverse ways; technology change can drive cultural change; appropriate policies are needed to encourage technology up-take.

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1. Introduction

Energy is of great importance in maintaining quality of life and economic development in all societies. As China's economy development is growing fast, commercial energy consumption is increasing. Research shows that the percentage of biomass energy consumption in China dropped from 81.5% in 2001 to 70.9% in 2008, while the percentage of commercial energy increased from 17.1% to 25.1% [1]. Although a decline in biomass could be due to a number

of reasons, one of the main causes is that China has excessively mined and used coal in the recent decades. For instance, energy consumption in China totalled 3.62 billion tons of standard coal in 2012, of which coal consumption amounted to 2.566 billion tons, accounting for 70.9% of total Chinese energy consumption and about 50% of coal consumption in the world.¹ Ali Akkemik et al. [2] pointed out that the structure of Chinese energy consumption structure is highly dependent on coal at present and this poses immense environmental challenges. However, in less developed regions such as north-west China, biomass energy is still a main source of energy for rural households.

In many remote rural areas, the poor have to depend on firewood and other biomass fuels for cooking and heating. Since it is

* Corresponding author. Suite 504, Yifu Science Building, MOE Key Laboratory of Western China's Environmental Systems, Collaborative Innovation Centre for Arid Environments and Climate Change, Lanzhou University, 222 South Tianshui Rd., Lanzhou 730000, Gansu Province, China. Tel.: +86 931 8915589/+86 13893610296 (mobile).

E-mail addresses: wgd@lzu.edu.cn, 1137976549@qq.com (W. Ding).

¹ http://www.gov.cn/gzdt/2013-02/22/content_2338098.htm.

difficult for rural households to obtain commodity energy, over 66.7% of rural residents' energy for daily life relies on traditional biomass energy including crop residues, straw/stalks, firewood, and livestock dung, which leads to an excessive consumption of biomass energy and causes serious soil erosion, ecological environmental disruption and a decrease of organic substances in the soil [3–8]. The challenging and time-consuming task of collecting and managing traditional fuels has been widely viewed as women's responsibility [9]. Globally, about 2.7 billion people in developing countries, of whom about 82% live in rural areas, depend primarily upon traditional biomass energy for cooking and heating [10,11]. As in China, women in many other developing countries also undertake the responsibility of collecting firewood, cooking and taking care of children and the elderly. On average, women in India walk 30 km per month and take 2.7 h per trip for fuel wood collection over hilly terrain, often at high altitudes and as a result have medical conditions such as stiff-neck, backache, headache and loss of work days [12]. In addition to hard work, women in rural communities are often exposed to indoor smoke pollution. The evidence indicates that women exposed to indoor smoke are three times more likely to suffer from chronic obstructive pulmonary diseases (COPD) such as chronic bronchitis or emphysema than women who cook with cleaner energy sources [13,14]. The World Health Organization (WHO) has included ischemic heart disease related deaths as one of the impacts of household air pollution in its latest risk assessment of the global burden of disease (GBD) project [15,16]. WHO further indicates that women along with their children have higher risk of death when they are often exposed to smoke from inefficient stoves in poorly ventilated homes, which kills 1.45 million people each year, and causes a death in every 20s. Therefore, indoor air pollution has become the fourth biggest killer in the developing world [17,18]. Moreover, overuse of biomass energy often leads to environmental degradation. There are serious adverse consequences for health, the environment, as well as for social and economic development, especially when resources are harvested unsustainably and energy conversion technologies are inefficient. Consequently, it is well accepted that improving traditional rural energy structures through technological advances will alleviate women's heavy workload and health problems. Improved cooking facilities are one such technological advance, which can alleviate these bottlenecks by improving maternal health, reducing child mortality rates, and reducing the time-lost by young women in fuel collection, cooking and processing, as well as reducing negative environmental impacts and pressures on fragile ecosystems [19–23].

Many researchers have conducted studies on the relations between gender and energy mainly in developing countries. Gender in this article refers to the range of physical, mental, and behavioral characteristics pertaining to, and differentiating between, masculinity and femininity [24–26]. Depending on the context, the term may refer to biological sex (i.e. the state of being male, female or intersex), sex-based social structures or social roles (as in gender roles), or gender identity [24–27].

Access to electricity, biomass, wood stoves, micro-hydro programs and other energy sources can significantly improve gender equality. SIBAT (Sibol ng Agham at Teknolohiya, or Wellspring of Science and Technology) [28] has published a report on Gender Mainstreaming to Strengthen Community Based Renewable Energy Systems in the Philippines. The report pointed out that the gender mainstreaming project had the following impacts on women and men: (1) electricity decentralization has helped raise the productivity and incomes of households and communities, including improvements in women's productive and household work; (2) the project has been able to pump and deliver water to households, minimising the work of women and children in fetching water for

household use, gardening and livestock raising; (3) access to water facilities has also minimized water-borne diseases, which in turn has reduced women's work in looking after sick children and other family members; (4) electricity provided by the project to run rice mills has succeeded in reducing women's manual labour hours (indigenous women, who used to pound rice for every meal, every day, have particularly benefited from this initiative); and (5) women are being empowered to take care of potable water projects. A technical brief jointly produced by ENERGIA and Practical Action Sri Lanka [29] indicated that the impacts of rural electrification on women include the following positive changes: women in electrified households in India read more; there are savings of 1–2 h per day due to avoided journeys for battery charging and kerosene purchases, and less time spent on household activities such as grain grinding in Sri Lanka; improved homework and school performance, avoidance of eye problems, and increased enrolment of girls in schools in Tunisia; increased opportunities for employment of women in electrified households and greater income in Bangladesh; maternal health benefits from clinics with improved facilities from electrification in the Philippines; improved security provided by lighting paths and areas around houses to protect against potential attacks from people and wild animals, including snakes in both Sri Lanka and Uganda; improved health and safety as the need to use flammable fuels such as kerosene is reduced in Uganda and Sri Lanka; and household budget savings are found in switching from kerosene for lighting in many other countries. However, electricity was an expensive option and therefore not very attractive to women in some rural communities. The major lesson learnt from the electrification programs is that a program should build on the existing activities and strengths of a community.

Traditional energy sources in most developing countries are woody biomass, agricultural residues and animal waste. Traditionally, and by custom, women are usually responsible for the gathering of firewood for cooking and space heating. However, the increasing distances that have to be covered to collect firewood, has led to a shift in this responsibility with men now involved in firewood collection using mechanised animal-drawn transport. In addition, the local depletion of wood resources, and the corresponding increase in the distances necessary to collect this biomass, has caused global concerns [30].

Some international development organizations such as the World Bank and the Hong Kong based Kadoorie Charitable Foundation have made efforts to promote energy saving wood stoves in order to reduce the amount of wood required for cooking and space heating. One of the interesting lessons learnt from the programs is that [30] most women were put off by the need to chop wood into smaller pieces to suit the new stoves; most of the men had left their rural areas to seek employment, and the women felt that the additional task of chopping wood was time consuming and diverted resources from other activities. A second factor raised was the positioning of the stoves. The new stoves were usually placed against a wall to allow smoke to be expelled through a chimney. This meant that a woman had to cook with her back to her family, which is considered disrespectful in some local customs. This positioning also restricted the ability to monitor children playing in the house. Some of the promoted wood stoves were built outside the house and women were not always comfortable with this for reasons of privacy and fear of positioning. The taste of the food was also a factor and the feeling was that the smoke from an open fire helped to preserve the food better.

Making policymakers become interested in translating updated energy knowledge and skills into actions would be one of the better choices in gender equality. ENERGIA [31] has launched an e-discussion group activity, drawing concerns in designing and

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