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Research Paper

Changes in Fuel Use at Domestic Level in Rural Life: The Context of a Village in Rajshahi District of Bangladesh

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Abstract

Fuel is a burning issue in Bangladesh as well as in today's world. Domestic is one of the main sectors of fuel consumption. There is no denying that much research is being conducted on fuels. However, changes in fuel use and fuel use at the domestic level have not been studied yet, although changes in many other aspects of culture have been studied. As a result, we do not have enough information to make policy recommendations in this area. Basically, research regarding how fuel use changed over time is important in the current fuel crisis situation since, to cope with the present or upcoming fuel crisis, it is important to know how a group of people collected fuel in their different ecological and socio-economic conditions. Given the significance of past coping strategies in fuel collection, this study sought to identify fuels and fuel use dynamics at the domestic level in rural Bangladesh. Applying qualitative research methods, this research found that changes in fuel use at the domestic level occur as soon as the agricultural technology, cultivation system, and market demand of any crops change. Also, changes in livelihoods and lifestyles, urbanization, and the globalization of technology create noticeable changes in domestic fuel use in Bangladesh. This research invites researchers from universities and development agencies to conduct future long-scaled research with a huge number of respondents from diversified backgrounds to produce knowledge regarding changes in fuel use at the domestic level in rural and urban areas of the country.

Keywords: *Changes in Fuel Use; Biofuel; Rural Life; Energy Scarcity; Renewable Energy*

INTRODUCTION

The importance of fuel in human development and civilization cannot be denied. We cannot even think of the modern world, development, industry, and daily life without fuel. Fuel is important not only in the modern world of development and industry but also in folk life, as it has been used in daily folk life since the ancient period. People have used solid biofuels, such as wood, charcoal, dried manure, etc., since the day they discovered fire (Songstad et al., 2010). Home is one of the sectors where fuel is used much. It is biofuel and, in some cases, fossil fuels that have enriched folk life since ancient times and thus have been an important part of folk culture. Cultural change is another important thing. It is one of the characteristics of cultures and their elements that they change over time (Haviland, 1990; Ferraro, 1992). It is found that all the elements of a culture are interconnected and change when other elements change (Haviland, 1990). In this sense, since there have occurred changes in politics, society, family system, religion, kinship, and economic system, the fuel system can also be thought to be changing. This is praise-worthy that the changes in politics, society, family system, religion, kinship, and economic system have been studied in a number of research studies. But changes in fuel use at a domestic level in villages have not been studied yet. However, research regarding changes in fuel use at the domestic level can contribute to this situation of the fuel crisis in this world by presenting how a group of people collected fuel in their different ecological and socio-economic conditions so that there can be prescribed some solutional recommendations to cope.

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Bangladesh is a developing country located in the South Asian part of the world. Like other countries in the world, Bangladesh is also at risk of energy/fuel scarcity since its limited petroleum oil and gas resources seem to be finished within the next 20–30 years (MoEF, 2010). Bangladesh has a long tradition of using fuel at the domestic level. Again, the historical changes in its politics, economy, food habits, technology, kinship network, livelihoods, and urbanization over time (Murshid, 2006) are assumed to bring changes in fuel use at the domestic level, which is one of the biggest sectors of fuel consumption in Bangladesh (Rouf & Haque, 2008). In the times when there was no industry in the ancient period of time, the family was the only sector of fuel consumption. Again, even this is not overestimated that in societies where there is no developed industry sector, the family is their main fuel consumption sector. However, development in almost every sector in the country has occurred in the last few decades, which brought many opportunities as well as challenges in the fuel sector too because of all sectors' interconnection.

Rajshahi is a district located in the northwestern part of Bangladesh. The country's almost identical geographic characteristics and historical, political, economic, technological, cultural, and religious elements are found in the Rajshahi district, which is bound to create a similar environment for using fuel at the domestic level. Moreover, the possibility of changes in fuel use in Rajshahi is the same as in other parts of the country.

Considering the above-mentioned thing, this study has been conducted with the view to analyze the changes in fuel use at the domestic level in rural Rajshahi. To know overall details about fuel consumption at the domestic level in rural areas of Bangladesh is the aim of this study. In spite of this, the current research has been done based on a few objectives, which are as follows: (1) To know the changes in the use of fuel in daily life. (2) To understand the changes in fuel in rural life.

LITERATURE REVIEW

SREDA (2015) indicates that the consumption of biofuel at the domestic level in Bangladesh is decreasing, whereas the consumption of fossil fuels is increasing. SREDA (2015) suggests the development of a renewable energy sector to fulfill the demand for fuel. But SREDA (2015) does not indicate the reason behind the changes in fuel use at the domestic level. Similarly, Shetol, Rahman, Sarder, Hossain & Riday (2019) present the present status of the gas fields of Bangladesh. But nothing is found about the changes in fuel use at the domestic level in Bangladesh. According to Karim et al. (2019), the fossil fuels that are mostly used in the production of electricity include natural gas and coal. The demand for fossil fuels cannot be satisfied by the existing reserves. Because of this, renewable energy sources such as hydroelectricity, biomass, biogas, solar energy, and wind are recognized as significant sources of energy and are the ideal replacement for fossil fuels in situations of climate change and growing energy use. Additionally, they downplayed the value of and daily use of folk fuel in rural areas.

Uddin, Taweekun, Techato, Rahman, Mofijur, & Rasul (2019) found biomass energy production as a solution to rapid fossil fuel depletion and its impact on nature and the climate. Their article also lacks discussions on changes in fuel use at the domestic level. Accordingly, Uddin, Rahman, Mofijur, Taweekun, Techato & Rasul (2019) also found renewable energy as an important energy source in the situation of energy crisis. They also did not discuss changes in fuel use at the domestic level. In the same way, Huda, Mekhilef & Ahsan (2014) also present the scope, potential, and technologies related to biomass resource usage in response to rapid population growth and development. They also did not discuss changes in fuel use at the domestic level.

MoEF (2010) asserts in a brief that fossil fuels are assisting in climate change through their emission of carbon dioxide. Contradictorily, climate change also increases the demand for energy/fuel in producing power to ensure food security and industrial development in climate change effects such as droughts, floods, and so on. Renewable energy resources, i.e., solar, wind,

hydropower, biogas, biofuel, etc., are expected to reduce pressure on the fossil fuel supply. But changes in fuel use at the domestic level were not discussed in MoEF (2010)'s study.

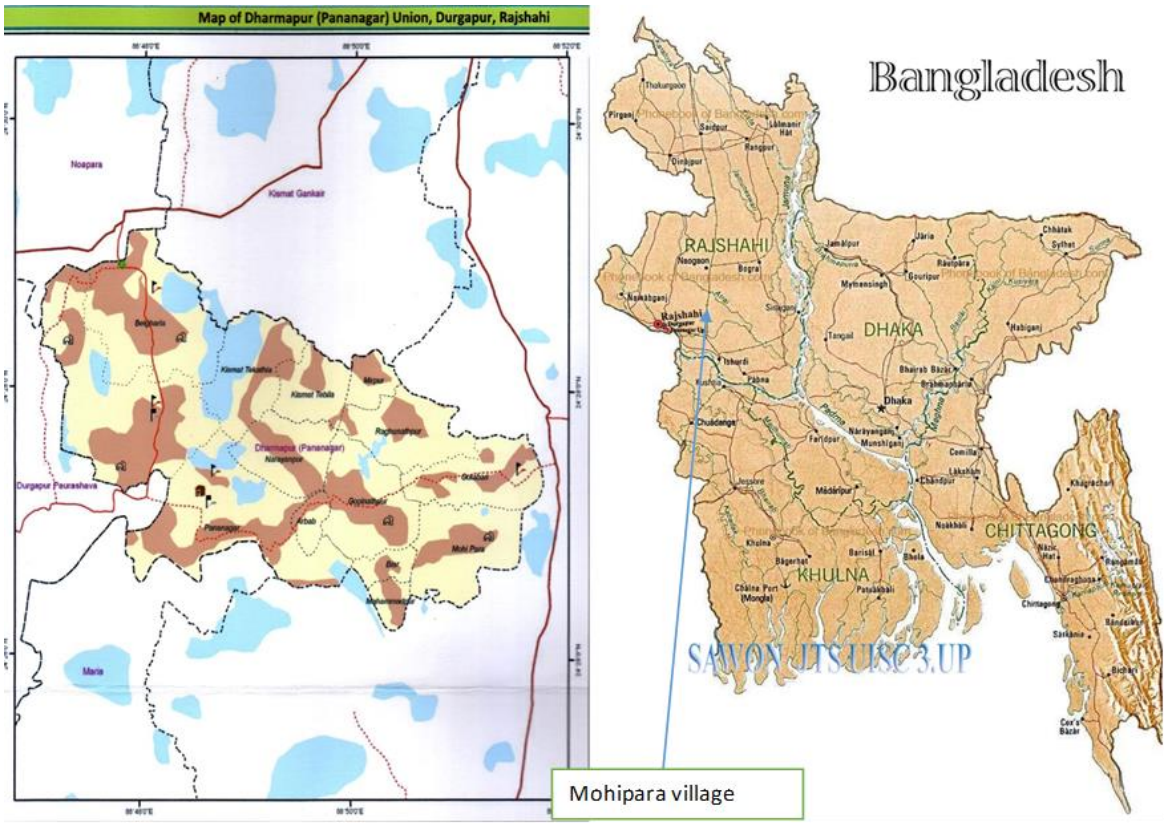
RESEARCH METHOD

This research has been done following the qualitative research approach. Mohipara village of Durgapur Upazila of Rajshahi district was selected as the research area for this research. For collecting primary data, a random sampling method was used while selecting the respondent. Also, to target a specific respondent, we assessed their knowledge, convenience, and desire to participate in the interview session. For secondary sources or literature, we have collected literature, both global and local, that goes with our study objectives and sorted it out under larger categorization. For secondary sources, we have taken into account books, and journals found relevant to the issue of interest. The document review method was used as a secondary qualitative data collection tool. For primary sources of data, we have addressed different participants, such as wage laborers, farmers, and people who do not have an agro-profession. Unstructured interviews and observation methods were used in order to collect primary data. The family has been considered as a unit of analysis in the study. The inductive analytical method has been used in this research.

FINDINGS AND DISCUSSION

Findings

People in Mohipara village have long used biofuel and fossil fuels in their daily lives. This village's residents primarily use biofuel for cooking, heating, and lighting. The use of fossil fuels was limited to cooking.



Map Source: http://pananagarup.rajshahi.gov.bd/bn/site/page/U6Ru-%E0%A6%AE%E0%A6%BE%E0%A6%A8%E0%A6%9A%E0%A6%BF%E0%A6%A4%E0%A7%8D%E0%A6%B0%E0%A7%87-%E0%A6%87%E0%A6%89%E0%A6%A8%E0%A6%BF%E0%A7%9F%E0%A6%A8

Figure 1. Study Location

In the past, people used to use *ghuta/londa*[1] in cooking. Generally, women used to collect fire sticks from outside. However, it was a prestigious thing in rural life that women were not to go to collect firewood from fields and that women would prepare *ghuta/londa* at home since it would mean their economic self-dependence. The use of folk energy can be best understood by the song *'ek din aamar chilo gola bhora dhan aar goyal bhora goru.'*, which means '*Once I had a huge amount of rice and cows*." Generally, people supply the energy they need through agriculture and husbandry. Besides *ghuta/londa,* people used to use straws, cane waste, wood, crop waste, and so on. The people with a bounty of wealth and agricultural land had more cattle than others and got the energy they needed from them. But those who were economically poor were bound to cut the straw from the field of their landlord in order to get energy. Again, their house was built with bamboo, wood, straw, palm leaves, jute sticks, and other natural elements. When the house was rebuilt, these elements were used as fuel since new elements were used instead. The fence they made in order to encircle the crop field had also been used as fuel. They did not need more energy since there were no complexities to life and demands.

People in Mohipara village have been using biofuel for a long time. People of this village get the biofuel themselves. People who cultivate rice, jute, sliced, maize, and oil crops generally get these fuels. But those who do not cultivate these crops are meant to be devoid of these fuels. Those who do not cultivate jute work as wage laborers at the time when jute is cut, rotten, and washed. When it is time to wash jute, many day laborers take jute sticks as a daily wage instead of money. The cultivators also share jute sticks with their kin, relatives, and the owners of the land where they put these sticks temporarily. This is also applicable to *larha*[2]*.* After *Aman*[3]*,* rice is cut in the months of *Kartik*[4]*,* and *Aghrahayan*[5]*;* they cut *larha* and bring it home. It is paddy, chilly, oil crops, and spring pulse crops that they collect and thresh at home. That's why they do not need extra effort to collect. But the summer oil crops, pulse crops, and maize are collected, and the entire tree is left on the land. In this case, people who do not cultivate these crops also collect and use fuel. Landowners generally give permission to collect these fuels since the field also becomes clean by taking these fuels, whereas it could take extra labor to clean. There are trees beside homes and village streets, from which the people of this village collect leaves and dry wood. They also get wood when there are broken trees and their parts in storms in the months of *Chaitra.*[6] and *Boishakh*[7]*.* People are still using it. It is seen that those who have cattle make fuel by themselves. Those who have some land also collect agro-wastes and use them as fuel. It is after the crop collection that they collect folk-fuels. Generally, women collect these energy elements. When they get heavy wood, the male members of the family collect it. They dry these fuels in the sun so that they can burn well. But while making *ghuta* or *londa*, they collect cow dung first. Then they make it flexible by massaging it with water. After making it flexible, they cover the *singot* and cane with it and dry it in the sun so that it burns well.

[1] Dried cow dung on sticks or cane.
[2] The paddy plant's lower part.
[3] One kind of rice is planted in the rainy season and harvested in the month of *Kartik* and *Aghrahayan.*
[4], the seventh month of the Bangla year, which continues from the second half of October to the first half of November
[5], the eighth month of the Bangla year, runs from the second half of November to the first half of December.
[6] The last month of the Bengali year.
[7] The First month of the Bengali year.

Though the village people easily get and collect these fuels, they suffer from fuel scarcity in the rainy season since cane, straw, *cow dung,* leaves, and so on remain wet and get rotten for this reason. Based on life experience, people know this situation very well. Keeping this in mind, they preserve fuel for the rainy season. Generally, it is the kitchen where they keep fuel. But when there are more elements of fuel, they make room for keeping firewood. Waste products such as cane, straw, cow dung, leaf, and so on that go unused during the rainy season due to a lack of sunlight are combined so that they rot well. After a few months, they are transformed into manure and biomass. These items of bio-fertilizer are used in agricultural lands, which helps them minimize production costs and get more crops.

There has never been a scarcity of biofuel in this locality. People of this locality have cultivated varieties of crops on their lands and reared cattle at home. As a result, they fulfilled not only the family needs but also the demand for fuel.

But there is a change in the way fuel is used in this village. There are many new families who received higher education from different universities and are engaged in teaching, mechanical, health affairs, garments, small businesses, NGOs, and other non-agricultural professions. People from these families generally use natural gas in cooking along with biofuel. People who work outside the home and stay outside use natural gas now since their engagement in their work does not let them collect biofuels because of a shortage of time. In response, Jonas (38), a rich farmer in Mohipara village, said, *"I know how much my wife suffered while collecting fuel in the rainy season. Since our family income increased, we did not act miserly and decided to buy a gas stove."* Some families received gas stoves or kerosene stoves from family members. Susanna Mardy (60), a housewife, said, "*My daughter lived in Dhaka before her marriage and used a kerosene stove for cooking. When I met her in Dhaka 12 years ago, she gave me the stove, which I am not using anymore since I have a gas stove."* There are also some people who are now using it since they see other people in this village using it. Some people are seen to boast about their gas usage, and many people aim to buy a gas cylinder and a gas stove to cook food. The advantages of using fossil fuel instead of biofuel also lead them to use it. There are some shops where gas from different companies is sold at different prices. People can buy it easily.

Discussion

It is one of the features of the ancient villages of Bangladesh that they were self-sufficient and self-dependent. They themselves cultivated what they needed. They could fulfill their wants because of their strong kinship and reciprocal based relationship (Ali & Alam, 2019). On the other hand, village people were reluctant to change their lifestyle easily and had less connection with the complexities of formal politics outside, which made folk culture slowly change (Ahmed, 2012). It was possible to transfer culture almost accurately because of their strong kinship and reciprocal relationships and having fewer connections with towns, cities, and other parts of the country. They got the knowledge about fuel the same way. At the same time, Bangladesh has been known as a land of rivers and waters and as an agricultural country for a long time. Its rural economy is based on agriculture. Favorable weather and its geographic character helped to grow rice and other crops here. Its waters and rivers provide fish (Murshid, 2006). In addition to these benefits, this agriculture provided fuel to the people of this region (Huda, Mekhilef, & Ahsan, 2014). People of Bangladesh have long used cattle dung, agricultural relics, poultry droppings, water hyacinth, rice husks, etc., in biomass power generation since they are available in Bangladesh. Besides this, common biomass resources are rice husk, crop residue, wood, jute stick, animal waste, municipal waste, sugarcane biogases, etc. (Huda, Mekhilef & Ahsan, 2014; Sharif, Anik, Al-Amin & Siddique, 2018; Rauf & Haque, 2008). In 2008, 65.5% of the total energy consumption of the country was

supplied by renewable energy sources, and domestic sectors consumed 60.36% of the total energy (Rauf & Haque, 2008).

If we think of it in the context of Mohipara village, many things will come relevant. People of this village have long been cultivating rice, jute, chili, oil crops, and pulse crops. The waste of these crops has been used as fuel for a long time. They got wood and leaves from homestead trees. Their cow-rearing tradition also ensured the cultivation of land, manure, and family income. It also provided fuel since cattle dung is used in making *londa*. It is applicable not only to Mohipara village but also to the whole world that solid biofuels, such as wood, charcoal, and dried manure, have been used ever since man discovered fire (Songstad et al., 2010) and are renewable since they are dependent on agriculture and husbandry (The Royal Society, 2008). People have used this fuel since the beginning of civilization since they were dependent on agriculture and husbandry (Karim *et al.* 2019).

But people's dependence on agriculture for their living and livelihoods has shifted to the non-agricultural sector (PRAN, 2017). Many people from Mohipara are now working in NGOs, corporate offices, educational institutions, and garment factories. So, it is difficult for them to obtain biofuel as before. Those who are doing their office job from home are sometimes able to use solid biofuel, but it is difficult for those who live in towns and cities. On the other hand, the agricultural system is also not the same as it was before. Basically, the development of irrigation systems, assurance of fertilizer demand, and installation of modern technology have played a significant role in the development of agriculture in Bangladesh (Centre for Research and Information, 2018). These modern agricultural technologies have entered into agriculture and made agriculture more dependent on technology with the intention of high production with less labor. It is not deniable that cash crop marketing is common in agricultural societies because it raises farmers' standards of living, fosters economic development, and produces resources for their subsistence. Positively, cash crops improve farming, and the market economy, increase crop yields, diversify agricultural production, and control farming machinery such machinery high-yielding plants, fertilizers, as well as other technology (Shangdiar, 2021). However, agricultural production, mainly for commercial purposes, has an impact on traditional living, especially traditional fuel systems. As it is seen now in Mohipara village, the number of cows is decreasing because of the emergence of power tillers and chemical fertilizer since power tillers can cultivate land a few times more efficiently than cows can, and use chemical fertilizer rather than biomass is much used aiming at high production of crops. People rear a few cows only with the intention of commercial profit. They buy cows, make them physically attractive and healthy, and sell them at a comparatively high price. Not only is rearing cows, but also the cultivation of crops becoming commerce-based. People are no longer cultivating the crops their families need. Rather, they are cultivating them to sell them. People are now giving less value to the crops that give energy or fuel than the crops of high market value. The house-building elements they used to collect from agriculture and nature are no longer in use since they build residences with bricks, tins, concrete pilers, and so on, which are available in the market. As a result, the fuel they need for cooking does not come from agriculture.

At the same time, the development of the telecommunication system and the connection of Mohipara village people with towns and cities have increased because of the participation in service economic activities and urban educational institutions, which provided supportive elements in changing the lifestyle as well as the fuel system of village people. Many people in Mohipara watch television advertisements for gas, which has led them to use it. Furthermore, it is many men's dream to use it since they see it as a sign of development. Many of them see others using it and are inspired to use it. Some of them have the experience of living in Dhaka, where they had a liquid fuel stove. Some of them tell stories of their experiences as they make their way to the village. Many of them

had brought it with them so that they could use it at home. It is a new trend in Mohipara village that many people are using gas stoves for domestic use. Since gas is less expensive than petroleum oil, which does not require regular going to the market for buying, it has also been a matter of prestige to buy a gas stove since people with higher formal education are not expected to collect hard biofuels from the field. Rather, they depend more on the market for wooden fires. Moreover, as this is still a traditional society, kinship relations are helping the people of this village spread knowledge regarding fossil fuels and the technology regarding fossil fuels.

So, it is found that changes in the agricultural system, daily needs, market system, outer connections and livelihoods, and changes in the availability of foreign technology, modern information technology, and fossil fuel caused changes in fuel usage at the domestic level of Mohipara village. Basically, cultural changes happen as a response to environmental crises, intrusions of outsiders, or modification of behaviors and values within the culture (Haviland, 1990), which is already found in Mohipara village.

Changes in fuel use are happening not only in Mohipara village but also in most of the villages of the country. Though it is predicted that natural gas is less used in villages than in towns and cities in Bangladesh (Rouf & Haque, 2008) because of the huge use of biofuels, this number is increasing in villages too. It is true that biofuel is the main source of energy for domestic consumers, but fuel consumption patterns have changed in recent years. It is found that the percentage of total residential consumption of biofuel decreased from 81 to 70 percent between 2000 and 2012, whereas electricity increased from five to ten percent of consumption, and natural gas increased from seven to 16 percent of consumption, replacing the consumption of biofuels (SREDA, 2015). Basically, fossil fuel is being used because it can be found easily on the earth's surface and is explored almost in all parts of the world (Uddin, Taweekun, Techato, Rahman, Mofijur & Rasul, 2018). On the other hand, technology is spreading fast across countries. Even the knowledge of technology is also advertised by information technology and media (Menon, 2006). Bangladesh decisively embraced globalization in 1990 (Osmani, 2005), but the people of the villages could not make sense of it since its visible signs, i.e., fossil fuels, were absent in their case. Easily access to fossil fuels is one of the main reasons for not using traditional biofuels (International Network for Sustainable Energy, 2016).

So, in the context of fossil fuel's rapid decline, the demand for petroleum fuel seems too high and expensive in the immediate future (Vinichenko et al., 2021). So, more dependence of Mohipara village people on power and fossil fuel is likely to make them socio-economically vulnerable since their low economic condition may cause obstacles to accessing power and petroleum fuel unless the best alternative is confirmed. MoEF (2010) has insisted on renewable energy resources, i.e., solar, wind, hydropower, biogas, biofuel, etc., to reduce pressure on the fossil fuel supply. In this case, the traditional fuel and energy systems require significant attention in ensuring fuel and energy security and in mitigating climate change vulnerability due to their being renewable.

CONCLUSIONS

From the discussion above, it is clear that village people's dependence on agriculture, self-dependence of villages, strong reciprocal relations, strong kinship networks, and not having a connection with cities, towns, and other parts of the country resulted in the huge use of biofuels at household level as well as all sphere of the village in the ancient time. However, people have less dependence on agriculture, increased economic capacity, effects of electronic media, use of modern technology in agriculture, having alternative fuels available in the market, social prestige, and comparative lower kinship relations in the current moment have together developed a situation, where changes in fuel use in Mohipara village come as an ultimate result.

Many villagers of Mohipara village use fossil fuels in cooking, whereas they used biofuel

before. The tendency to use fossil fuel and electricity in household work instead of biofuel is increasing. On the other hand, the increase in fossil fuel use at the domestic level is meant to put them at vulnerability because of its effects on climate change; Bangladesh's vulnerability to climate change, its rapid depletion, its price rise, rapid population growth, and unawareness.

Considering the results, this research suggests some recommendations, which are as follows: (1) A public awareness program against the use of fossil fuels needs to be arranged, (2) The indigenous fuel system at a domestic level should be appreciated, (3) Sustainable and nature-friendly alternative fuel systems have to be discovered and regulated, (4) There should be a policy on using fuel at home, and it should be regularly investigated by the authorities, and (4) NGOs and international organizations should have programs in this regard.

LIMITATION & FURTHER RESEARCH

This research has been done in a small-scale location, which may not represent Bangladesh's holistic reality of domestic-level fuel change.

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