UGC Sponsored Minor Research Report

Comparative Study Of Availability And Accessibility Of Clean Cooking Fuels And Its Effects On Fuel Wood Consumption in Village Mhaskal Tal. Kalyan And Village Kanvinde Tal. Shahapur Dist. Thane , Maharashtra State.

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Executive summery

Introduction

Thane district in Maharashtra state is the home of aboriginal tribals like Katkaries and Thakars since ages, who mostly subsist upon forests and agriculture produce. Proximity to maximum city like Mumbai and growth of Thane city coupled with Mira Bhynder, Vasai Virar, Navi Mumbai, Kalyan Dombivali , Ulhasnagar, Bhiwandi and Ambernath-Badlapur has attracted large population to urban centers in the district. It is one of the most urbanized and industrialized district in the state and country. Western and South Western part of the district

is highly urbanised whereas Eastern and Northern parts are still rural, having forest intact. Most of the East, North and North Eastern parts of the district are experiencing fast and large scale industrialization and urbanization. Villages are becoming towns, towns becoming cities and cities are becoming mega cities. This socio economic change is responsi9ble for wide spread life style changes. Introduction of 24*7 television, Mobile phones, electrification and spatial and occupational migration is resulting in changes in food habits, use of transport means, and use of energy resources. Houses are getting transformed; Traditional chulhas are either assisted or replaced by LPG, Kerosene or renewable energy sources. District has highly urbanized and modern gated communities and completely impoverisehed communities equipped with modern communication means. Rural areas are suffering from this contradiction like they do not have sustainable and assured income sources but are shifting to recurring expenses like LPG connections, electricity bills, use of refrigerators and television sets coupled with mobile phones. In most of the cases these expenses are met with by selling family assets like land. Almost every village has outsiders buying land converting it into horticulture and plantation. This in some areas are making lots of fuel wood available for domestic use, makeing it available on sustainable basis but increasing population, availability and accessibility of alternatives like Kerosene and LPG are the determinants of shift from wood fuel to other sources. Affordability, accessibility, easy access to wood fuel are the most important factors in choices of energy source, made by families in the rural areas.

Many households are shifting from wood fuel to more efficient and clean fuels like LPG, kerosene and electricity, but still wood fuel remains main source of energy for cooking in India. Wood energy (fuel wood and charcoal) is, and will remain, an important source of energy in South and Southeast

Asia. The developing countries in Asia are home to approximately three quarters of the world's fuel wood users, but have only one quarter of the forest cover in the South. In most countries between 20 percent and 80 percent of energy demand is met by wood. The use of fuel wood is still increasing, though not as fast as the use of fossil fuels.

The paradox is explained by the fact that most fuel wood in Asia do not come from public forests. It has been found that about two thirds of all fuel wood originating from non-forest land. Major implications are that fuel wood consumption is not a general or main cause of deforestation, and that fuel wood consumption will remain, whether or not there are forests. The future of Asia's tropical forests and the problems of fuel wood users are not as closely linked as is often assumed.

The implications of wood fuel use for the global environment can be evaluated by estimating the associated greenhouse gas emissions. Emissions caused by wood fuel can be compared with emissions from alternative fuels. Though combusting wood emits CO_2 into the atmosphere, regrowth of wood captures $CO_2$from the atmosphere. Therefore, it can be stated that wood fuel use is carbon neutral, i.e. there is no net emission of carbon into the environment. Sustainability implies carbon neutrality, because the same amount of CO_2 emitted by wood combustion, is recaptured from the atmosphere by regrowth of wood. Dead plants if not used as fuel would simply decompose by natural processes, and lead to the emission of same amount of carbon in the atmosphere. If wood fuel is not utilized, some alternative energy source would be required and used, Alternative would be a fossil fuel, i.e. coal, gas, or oil products and renewables like solar and biogas. The effects of fossil fuel use on the global atmosphere have been well documented. Typical data for the emission of CO_2 per fuel and per unit of energy are available from the LEAP Environmental Database (SEI, 1995).

The implications of wood fuel use for environment can then be evaluated by estimating how much CO_2 emission from hypothetical alternatives is avoided by woodfuel use. The most likely (or least unlikely) mix of alternative energy sources varies, for the purpose of the present study, LPG can be considered the alternative. This leads to a simplistic though conservative estimate, because per unit of energy coal emits about 33% more and kerosene 7% more CO_2 than LPG. Based on the equivalence values of the fuels. If stove efficiencies

would be taken into account, the respective values would be about 122% and 24% higher if coal and kerosene would be the alternatives

Sources of Fuel wood in both villages consist of woody biomass, i.e. stems, branches, twigs, etc. The primary sources of fuel wood are both forest and non-forest land. Forest and other wooded land includes natural forests, scrub lands, wood and plantations. Non-forest land here includes agriculture land, agro-forestry systems, waste land, etc. The ratio between fuel wood originating from forest and non-forest land is not known, but data shows 2/3 fuel wood originates from private forest land, and about 1/3 from forest land. Typically, sources of fuel wood are located within a 5 km radius from the village. Secondary sources of fuel wood are residues from construction activities.

In the 1970s and 1980s it was generally assumed that all fuel woodoriginates from public forest land. This lead to the 'fuelwood gap theory' from which it was concluded that non-sustainable yields were taken from forests to meet wood energy demands. The theory resulted in the assumption that fuel wood use was a root cause of deforestation. But now, ample evidence exists to prove that the theory is false and that, except for localised areas, fuel wood use is not a main cause of deforestation. In the study area, major cause of deforestation is the ongoing conversion land use from natural vegetation into other land use like plantations and floriculture. This is generally carried out by machines with in a short period of time. Considering the rainfall in the area this leads to generation of lots of wood fuel every year.

Wood fuel consumption pattern shows that its spread over lower, middle and higher income groups and majority of the households in village use wood fuel for cooking and water heating. In both the villages wood fuel consumption is still increasing. In fact, consumption per capita is very house hold specific and influenced by factors like location, household size, availability and reliability of supply of the various fuels and their potential substitutes as well as their costs, the appliances required for utilisation, and culture and tradition. Most villagers still avail themselves of relatively simple and inefficient technologies for combustion. Efforts are being made to disseminate improved technologies. Where successful, the efforts result in improved quality of life, particularly for women. However, there is no evidence that shows the introduction of more efficient conversion technologies that have led to reduced demand for fuel wood from any households using these technologies. In both the villages agricultural biomass still not used as a substitution which is environmentally sustainable source.

At present, the main biomass fuels like crop residues like bagasse, rice husks and straw, coconut husks and shells, palm oil kernel, shells and fibre are not used. Wood and other biomass fuels (as well as animal dung used for fuel) can substitute for each other, but almost all villagers have a general preference for wood over other biomass. In terms of energy content per ha per annum, the sustainable production of biomass residues available for fuel from plantations and agricultural land is about 30 percent of the sustainable yield of fuel wood from natural forest land. In other parts of the country fuel wood represents about half of all biomass fuel consumption in energy units. Fuel wood can also be substituted by fossil fuels, but this is not practiced in both villages. Rather, the current overall accelerated use of fossil fuels in villages is mainly due to additional productive and consumptive activities behaviours of villagers. Such use is largely in addition to the wood fuels, rather than a substitute for them. The widely used term 'fuel transition' is often misleading, because what is actually going on is better described as 'fuel complementation'.

Data:

Primary data of twenty families from each village was collected. Each families educational background, occupation of each member of family, land ownership, animal ownership, type of house, source and amount of energy for cooking, heating etc was collected.

Methodology:

- Analysis of educational background
- Analysis of occupational background
- Estimation of family income
- Analysis of energy source and amount of energy used for cooking, water heating and tea making
- Estimation of per capita wood fuel consumption
- Calculation of correlation between education and energy source and per capita wood fuel consumption
- Calculation of correlation between income and energy source and per capita wood fuel consumption
- Calculation of correlation between caste and energy source and per capita wood fuel consumption

Village Mhaskal and Kanvinde are located in Thane District of Maharashtara state. Village Mhaskal is located in central part of Kalyan Taluka. It is just two kilometres from Muncipal Limit of Kalyan Dombivali Muncipal Corporation but there is no public transport facility available between village Mhaskal and Titwala a suburb of Kalyan having railway station. Bus facility is available from village to Kalyan City via Ulhasnagar which connects this village to

Ulhasnagar and Kalyan. Ulhasnagar being Commercial and industrial hub for small and medium scale enterprises, most of the villagers get employment in Ulhasnagar. Village is located on the banks of Kalu river and surrounded by hills coverd with lush green forest.

Village Kanvinde is located 2 kms from Mumbai Nasik highway and 4 kms from Atgaon railway station in Shahapur Taluka. Its been surrounded by forested areas with scattered paddy fields. Atgaon Industrial estate is close by. In both villages main occupation is agriculture but many young men work in nonfarm activities such as small and medium sized enterprises.

Availability, Accessibility and Affordability

User preferences for various types of biomass fuels depend largely on local fuel availability, accessibility and affordability. The three factors are interdependent. Accessibility can significantly limit the availability of fuelwood in a certain area, even where a large tract of natural forests exists in the neighbourhood. For example, people living in areas close to classified natural forests or protected areas e.g. designated national parks or wildlife reserves, strict nature reserves or biodiversity conservation areas, and important catchment areas or watersheds, no matter how big the forest area may be, sometimes have no or limited right of access to resources to meet their basic needs for forest products, including fuelwood. Natural physical barriers due to difficult terrain, steep topography, cliff and big river crossings, etc. also limit the access to local resources. Seasonal variation in climate may act as a further hindrance. Household decisions are influenced by economic affordability when choosing types of fuel amongst the available options. This is a major factor determining local fuel use patterns. Affordability may be defined in terms of cash, or time required for self-collection of firewood, or for collection through hired labour. A related factor which affects fuel wood supply is the cost of transportation. Fuelwood is a “high volume low value” good and faces economic limitations in long distance transportation. Fuel wood for subsistence are typically acquired within a range of 15-20 km from the user, whereas commercial fuel wood are normally acquired within a range of 80-100 km. In limited cases fuel wood is transported over long distances, e.g. as a load on an empty truck on a return journey. Further factors which can affect the level and patterns of fuel consumption include demographic characteristics, food preferences and local cooking habits, culture, tradition and rituals, climatic conditions and seasonal variations. These factors may limit the amount available as fuel wood, both for local collection and for market trade. The going market price tends to reflect local people’s capacity to

purchase these products, if no other forces interfere from outside. Though availability, accessibility and affordability affect the choices of fuel users, most users prefer fuel wood firewood and charcoal over inferior biomass fuels. This places fuel wood high up on the "preferred fuel ladder" as compared to traditional fuel substitutes. When traditional fuel woodare converted into modern forms of energy, due consideration should be given to the needs of the poor and their problems of availability and accessibility. Industrial commercial sectors are generally better placed to make use of commercial wood energy than the traditional fuel wood users in the domestic sector. As the residues of various kind are currently being used in most South Asian countries, future commercial application of scattered residues produced in smaller dispersed locations can create further hardships for poor and marginal farmers.

Urban people tend to believe that most fuel wood come from forests. It is one of the most persistent and disturbing misconceptions. Not all fish comes from the sea, not all fibres come from cotton, and not all chillies come from Chile. In fact, about two thirds of all fuel wood do not come from forests, but from agriculture and other land. Mounting evidence shows that fuel wood use is not a general cause of deforestation. It is not even a main cause. Rather, deforestation is caused by land conversion and commercial logging in most places. A cynic could say that deforestation is good news for fuel wood users, because they benefit twice. First, as long as deforestation goes on an abundance of wood residues becomes available for fuel. Second, when deforestation is completed most of the land is turned into plantations and agriculture, which provide more sustainable fuel wood per ha than forests do.

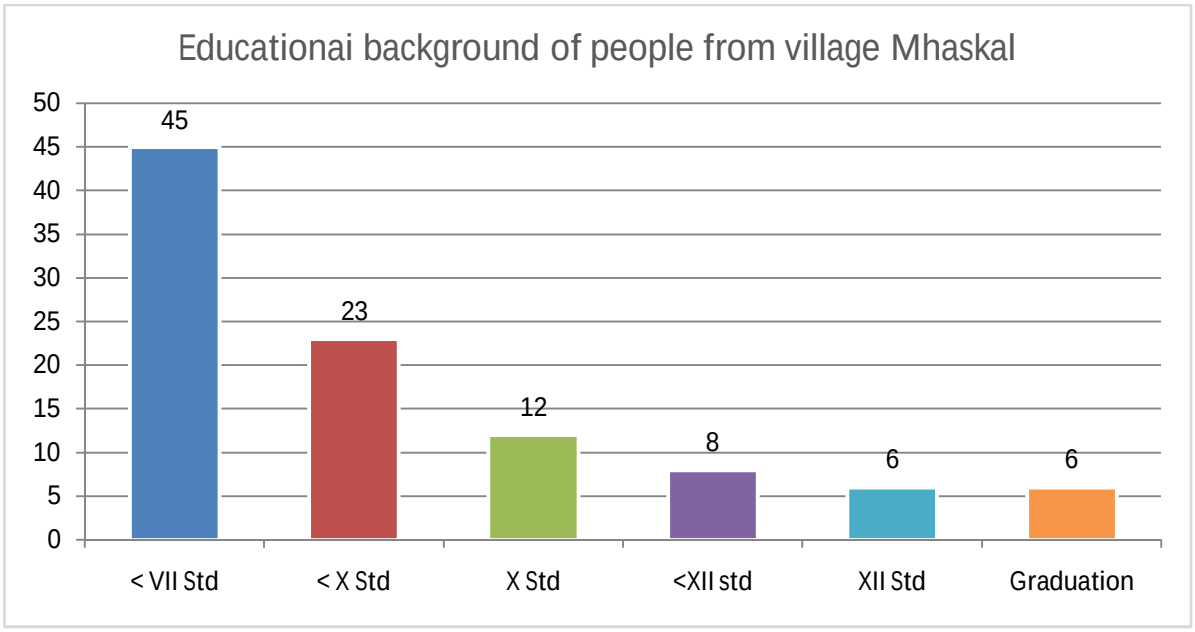
Dynamics of Consumption

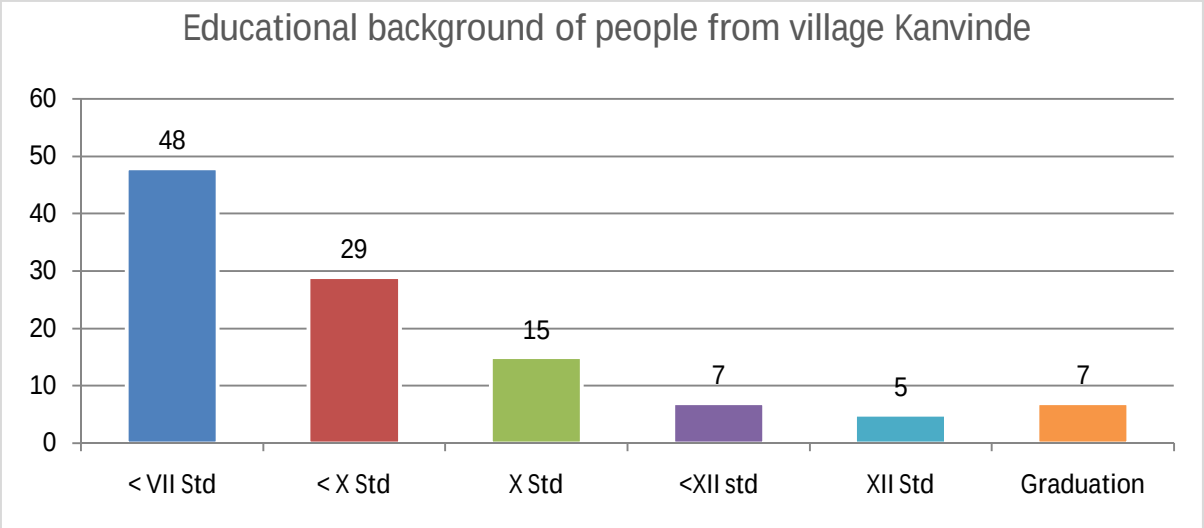
In response to reduced availability of fuelwood, a rural household use following options:

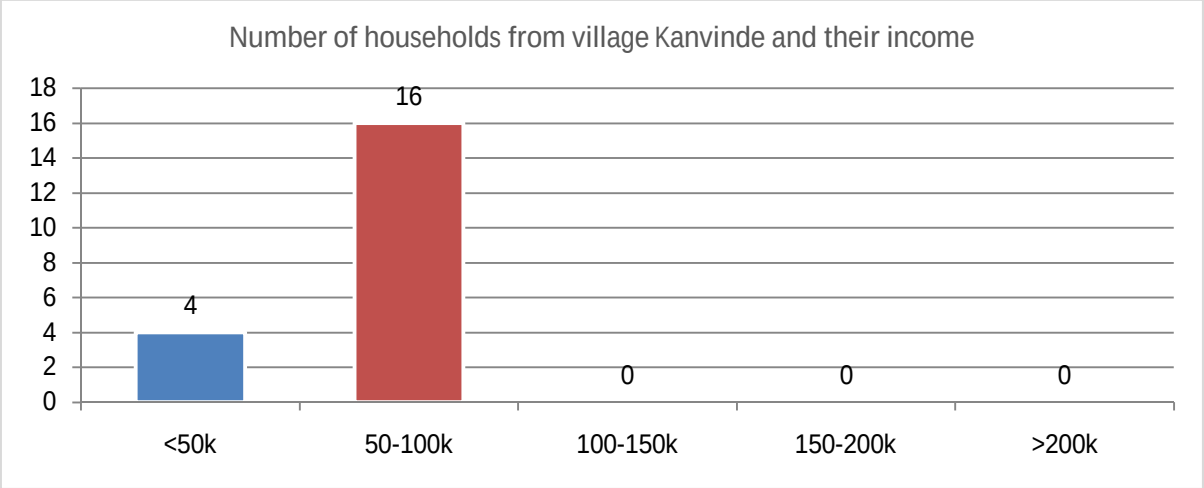
- Consume less by adopting fuelwood saving practices
- Substitute fuelwood partly by other biomass fuels or fossil fuels
- Pay more at local markets
- Spend more time in collecting fuelwood for free from distant locations
- Harvest fuel wood non-sustainably from trees nearby
- Grow additional fuel wood in the homestead
- Grow (additional) trees on agricultural land
- Change cooking practices (diets) so that less fuel is required

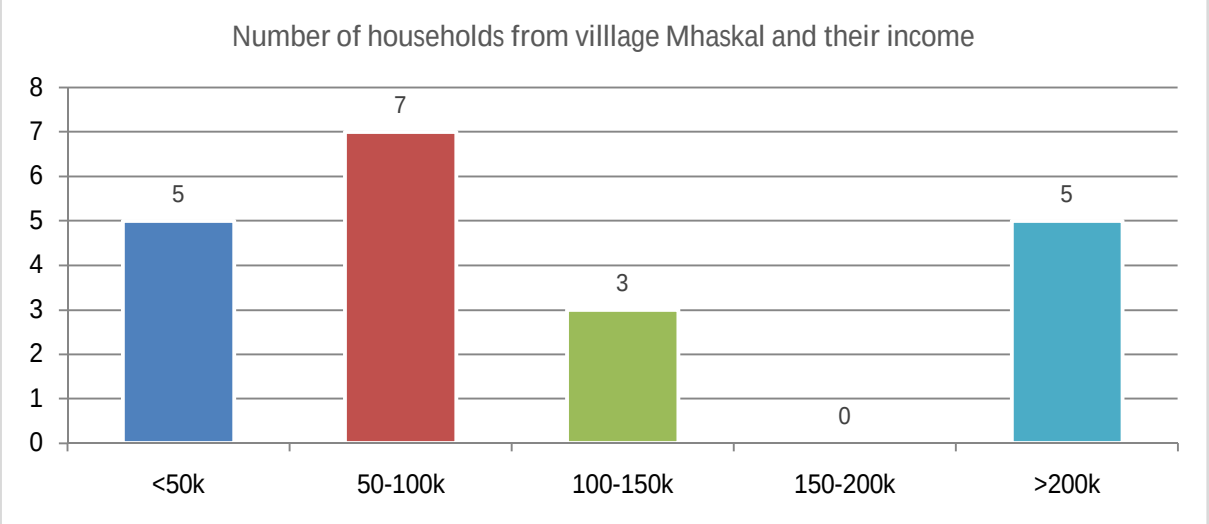
- Adopt a combination of options and/or other solutions

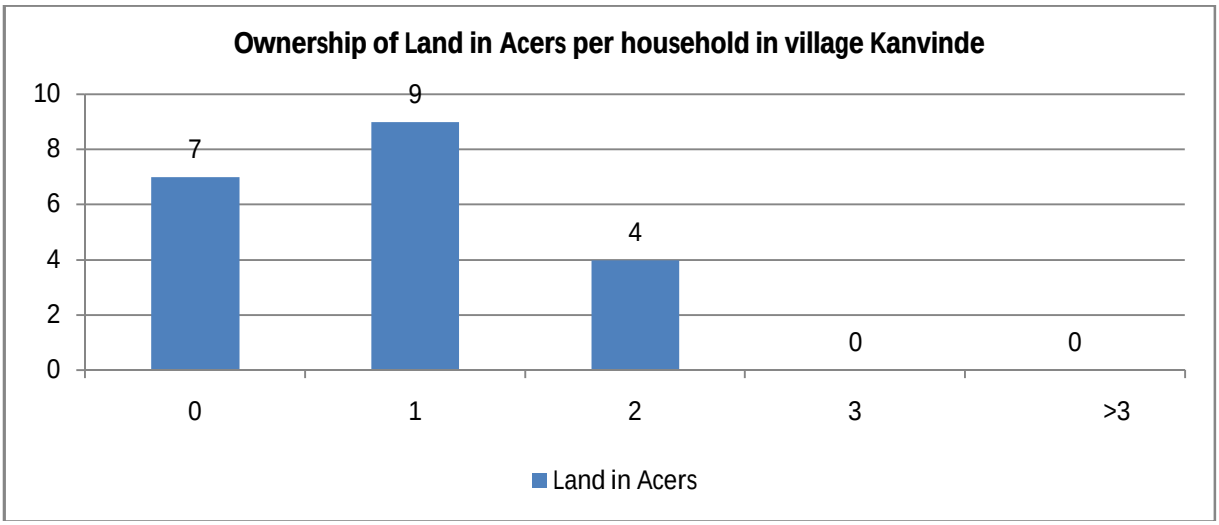
This shows that the range of options is very diverse indeed. Households which increase family incomes often switch from biomass fuels to other forms of energy like electricity and gas, which is known as 'stepping up the fuel ladder'. At the same time, new families frequently start at the lower end of the income and fuel ladder. However, many factors other than income can play a role with regard to household fuel use. If the new energy forms are not available or if the supply is not reliable, households may decide not to upgrade their fuel. Likewise, if fuel wood resources become scarce, people may downgrade to lower quality fuels. This illustrates that fuel switching is an extremely complex system, subject to many local factors. Site-specificity Case studies have shown that the actual response of consumer groups to changing conditions is very site-specific, varying per country and per region. A full set of reliable data on wood energy consumption and its dynamics is not available and cannot be obtained without considerable efforts. Therefore, 'best estimates' of consumption have to be made.

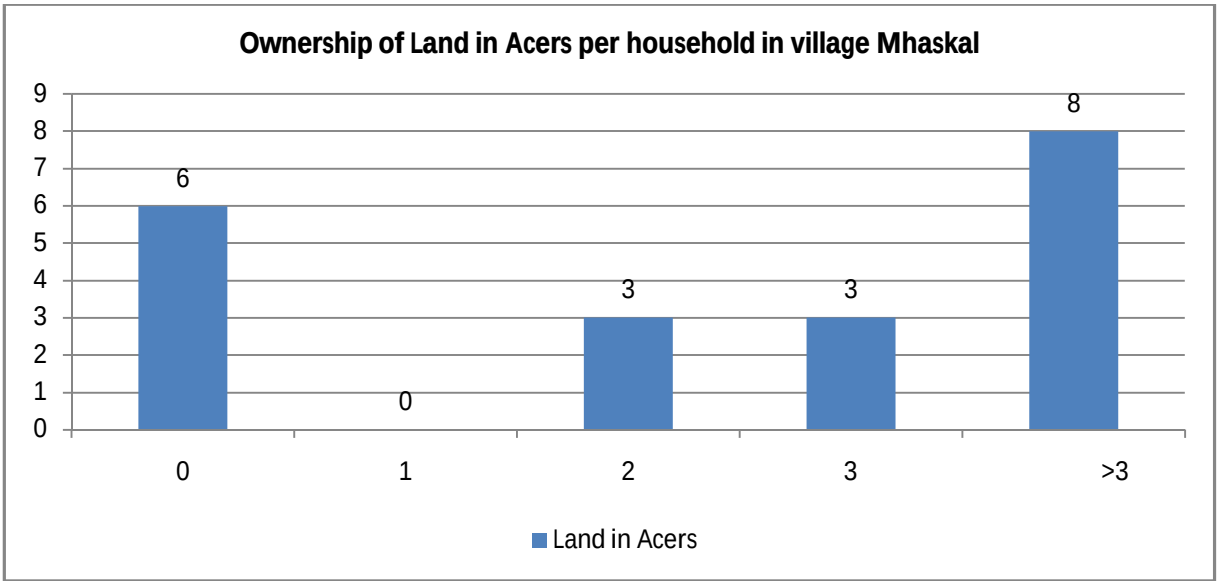


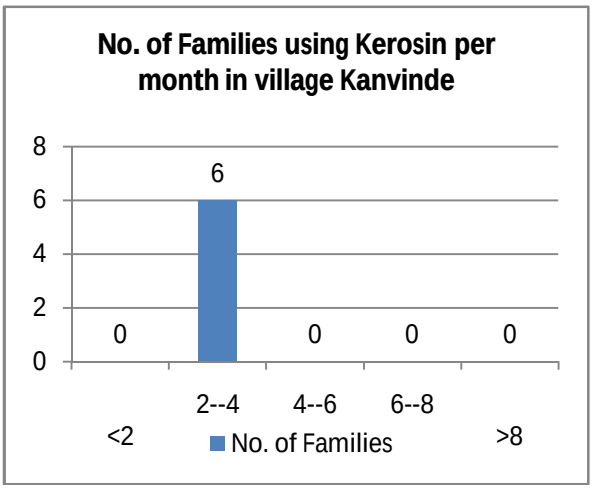

Educational background of people from village Kanvinde
60
50
40
30
20
10
0
48
29
15
7
5
7
< VII Std
< X Std
X Std
<XII std
XII Std
Graduation

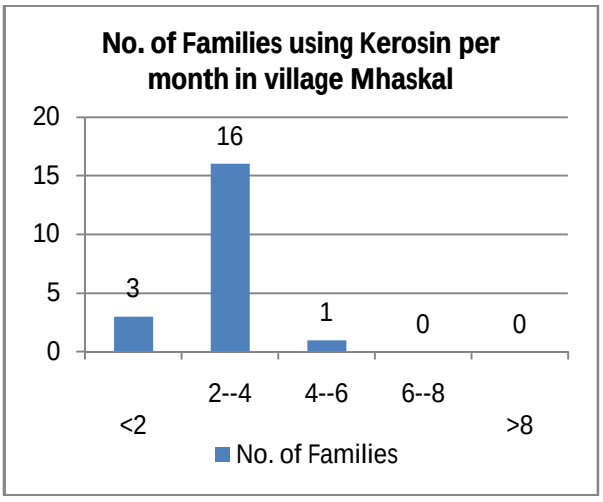

Number of households from village Kanvinde and their income
18
16
14
12
10
8
6
4
2
0
4
16
0
0
0
<50k
50-100k
100-150k
150-200k
>200k

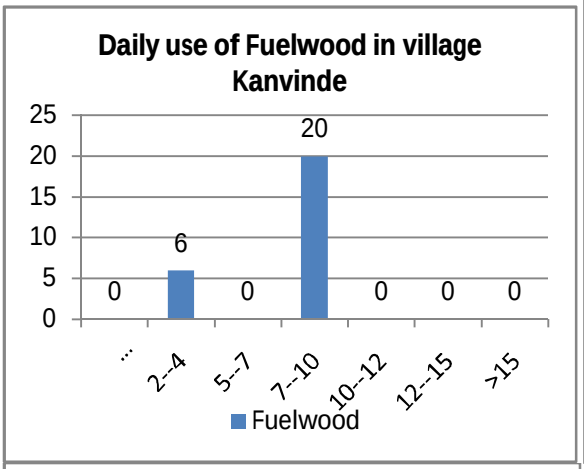

Number of households from villlage Mhaskal and their income
8
7
6
5
4
3
2
1
0
5
7
3
0
5
<50k
50-100k
100-150k
150-200k
>200k

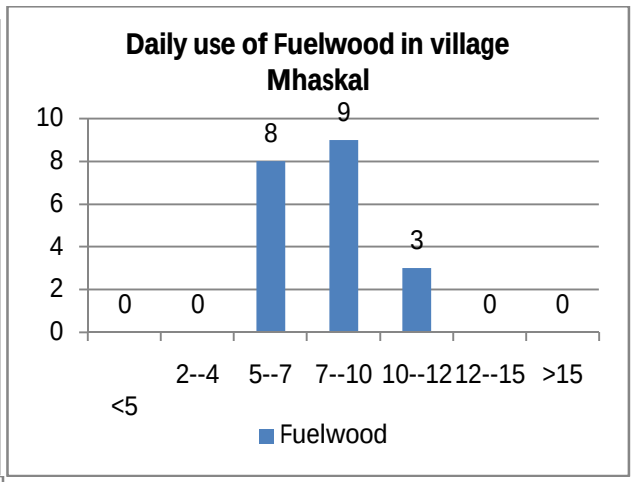

Ownership of Land in Acers per household in village Kanvinde
10
8
6
4
2
0
7
9
4
0
0
0
1
2
3
>3
Land in Acers

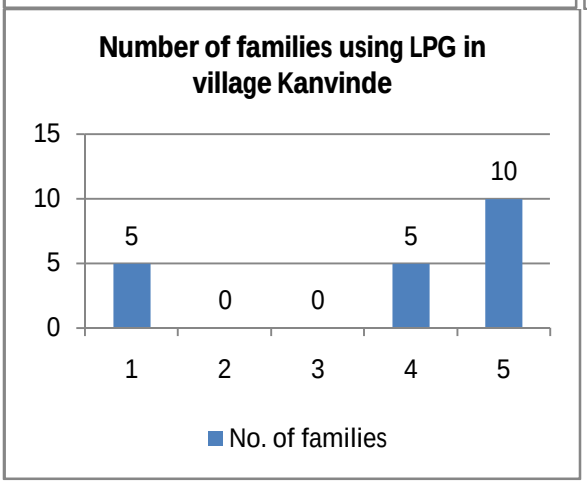

Ownership of Land in Acers per household in village Mhaskal
9
8
7
6
5
4
3
2
1
0
6
0
3
3
8
0
1
2
3
>3
Land in Acers

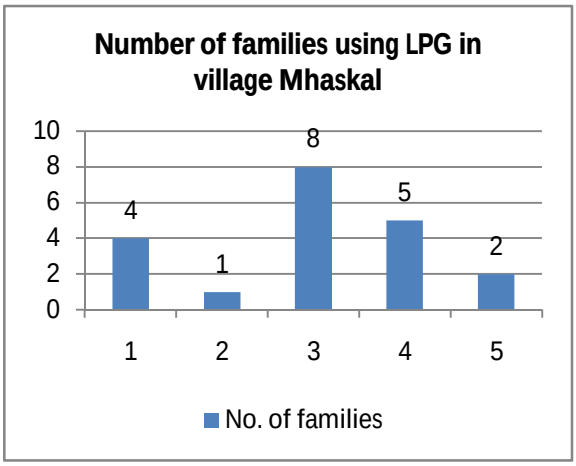

No. of Families using Kerosin per month in village Kanvinde
8
6
4
2
0
0
6
0
0
0
<2
2--4
4--6
6--8
>8
No. of Families

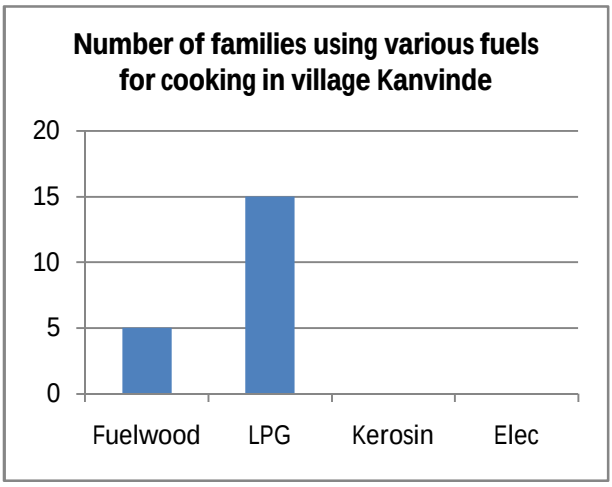

No. of Families using Kerosin per month in village Mhaskal
20
15
10
5
0
3
16
1
0
0
<2
2--4
4--6
6--8
>8
No. of Families

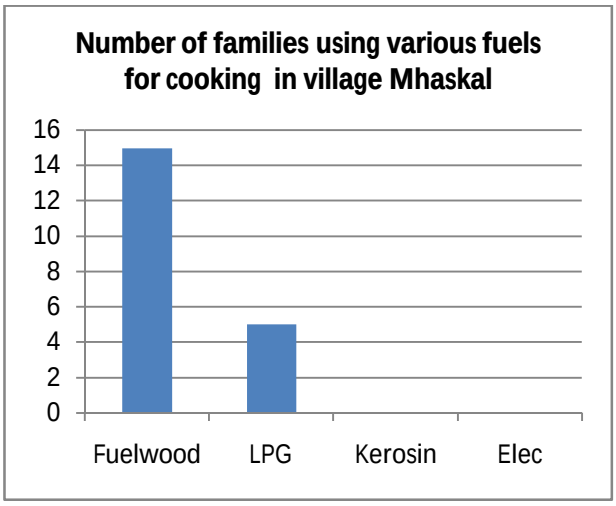

Daily use of Fuelwood in village Kanvinde
25
20
15
10
5
0
0
6
0
20
0
0
0
...
2--4
5--7
7--10
10--12
12--15
>15
Fuelwood

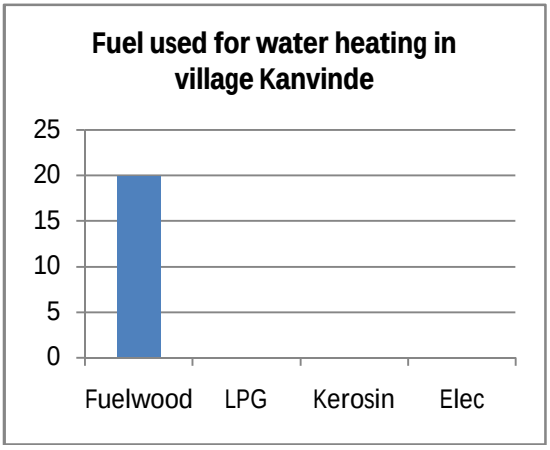

Daily use of Fuelwood in village Mhaskal
10
8
6
4
2
0
0
0
8
9
3
0
0
<5
2--4
5--7
7--10
10--12
12--15
>15
Fuelwood

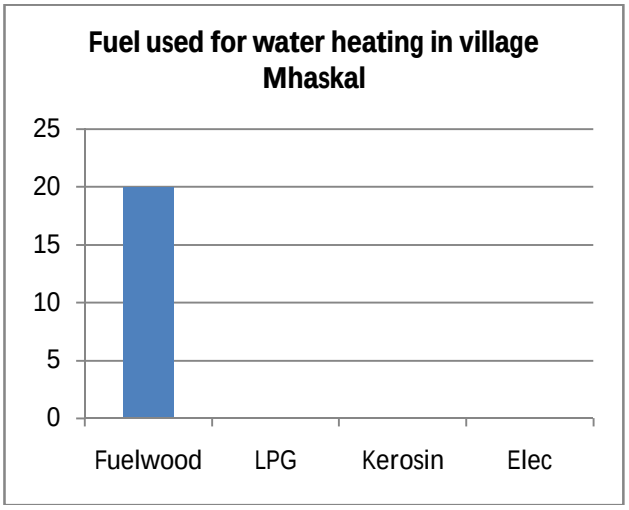

Number of families using LPG in village Kanvinde
15
10
5
0
5
0
0
5
10
1
2
3
4
5
No. of families


Number of families using LPG in village Mhaskal
10
8
6
4
2
0
4
1
8
5
2
1
2
3
4
5
No. of families









Conclusions and Recommendations

- Wood energy is and will remain an important sub-sector in all RWEDP member-countries. The consumption of wood and other biomass fuels will increase in the foreseeable future.
- Non-forest land will continue to be the main source of fuel wood. Wood energy use is not and will not be a general or main cause of deforestation.
- The prime area of concern is not the availability of fuel wood as such, but their distribution to people in need.

- The weaker groups in society, particularly women and children, are the ones who suffer most from restricted access to fuel wood sources.
- In Bangladesh and Pakistan, as well in Nepal to some extent, present national aggregated fuel wood consumption may exceed potential national supply. National fuel wood shortages may be aggravated by 2010.
- In India, Sri Lanka, Thailand and Vietnam, aggregate national consumption in 1994 is not limited by aggregate potential supply, but this may be the case in 2010. 10
- In most other RWEDP member-countries, residues from forests and crops represent an under-utilised potential to supplement fuel wood.
- Localised fuel wood scarcities may occur in all countries.
- The agricultural sector has a key role to play in supplementing fuel wood by enhancing fuel wood production on agricultural land.
- The positive benefits of an integrated wood energy development strategy include: development of private, community woodlots in private and community owned lands which are currently not properly utilized; expansion of private-, farm-, and agro-forestry areas; and support to conservation of soil, water and biodiversity.
- For this integrated strategy to be successful, a number of issues need to be addressed which impinge upon the mandates of various sectors including the forestry sector.
- In areas of fuel wood scarcity, other biomass fuels are likely to increase in importance as complementary sources of energy.
- As a first approximation it can be stated that fuel wood use is carbon neutral, i.e. there is no net emission of carbon into the environment.
- Thanks to fuel wood use in Asia, potential environmental costs amounting to at least 14 billion US$ in 1994, for recapturing CO2 from the global environment were avoided. These will increase to 17.5 billion US$ in 2010.

Recommendations

- The social, economic and environmental roles of fuel wood produced in both forest and non-forest areas should be recognised and fuel wood

should be treated as an important sub-sector which needs to be developed.

- Wood energy development should be integrated into rural energy supply strategies and pursued as a common task for all relevant sectors, e.g. agriculture, forestry, rural development, energy and industry sectors. Co-ordination among the sectors concerned should be strengthened.
- Fuel wood should be seen as an important product in its own right rather than just as a byproduct from agriculture land. Integrated fuel wood production on agriculture land should be promoted.
- Current reforestation and afforestation efforts should be continued. Natural forest management with people's participation should get high priority in areas where fuel wood is not (yet) a tradable commodity.
- Prevailing rules and regulations which hamper wood energy development should be reviewed. These relate to land ownership and holding, tree tenure, tree planting and harvesting in private and community lands, transportation and trade of wood and related products produced by the private sector or local communities. 11
- The selection of fast-growing tree species for wood energy crops, identification of appropriate provenance to match specific conditions, and improvement of the survival and growth rates of trees at degraded sites and waste lands, should be supported by further R&D.
- Infrastructure should be developed further in areas where fuel wood is already a traded item and where potential exists for supply enhancement to meet the existing and growing market demand.
- The effective use of by-products and residues from wood industries, partly by converting them into modern wood energy, should be encouraged to reduce wood waste and supply additional fuels.
- R&D for upgrading and combusting fuels from crop residues and other loose biomass should be promoted. Households as well as traditional industries should be encouraged to use them.
- More key data on wood energy supply should be collected to support wood energy policies.
- Wood energy databases should be established at regional, national and local levels. Private and public sector agencies related to wood energy

development should be given access to information to support their activities.

- Wood energy subjects should be integrated into the training curricula of relevant sectoral education and training programmes.
- The priority within wood energy conservation programmes should be the supply of convenient, healthy and attractive household stoves at affordable prices, so as to reach the maximum number of wood energy users.
- The cost-effectiveness of wood energy development projects in Asia in terms of global CO_2 savings should be communicated to interested donor agencies

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