Gender and Equity in Bioenergy Access and Delivery in Kenya

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1.0 Background

1.1 Definitions

Gender

Gender refers to socially constructed roles and relations between men and women. This includes the different responsibilities of women and men in a given culture or location. These roles vary within and between cultures, ethnicity and class and change over time.

Gender equity

Gender equity means fairness of treatment of women and men, according to their respective needs. This may include equal treatment or treatment that is different but considered equivalent in terms of rights, benefits, obligations and opportunities. In the development context, a gender equity goal often requires built-in measures to compensate for the historical and social disadvantages of women[1]. In the context of this paper, equity is taken to mean full and equal access to benefits of energy services, as well as participation in production and consumption.

Bioenergy

Bioenergy comes from any fuel that is derived from biomass. Biomass means any plant-derived organic matter available on a renewable basis.

Modern bio-energy technology covers a number of technological areas including: (i) Biomass powered electric power plants (Combined heat and power, CHP); (ii) Liquid biomass fuels: bio-ethanol and bio-diesel; (iii) biogas production technologies; and (iv) Improved efficiency cookstove technology.

Liquid biofuels are liquid fuels that can be produced from agricultural and forest products or the biodegradable portion of industrial and municipal waste. The two most common forms of liquid biofuels are bioethanol and biodiesel. Bioethanol is produced from agricultural products such as starchy and cereal crops (sugarcane, corn, beets, wheat and sorghum) while the main feedstock used in biodiesel production are oil crops and trees such as rapeseed, soy, sunflower, palm, jatropha or coconut (Dufey, 2006).

1.2 Gender and Equity in the International Context

The 1992 UN Conference on Environment and Development (UNCED), also called the Earth Summit, led to international consensus on the need for sustainable development that balances economic growth with concerns for social equity and environmental protection. Extension of the benefits of development to all people, men and women, is fundamental to the fulfilment of the social equity objectives of sustainable development.

[1] UNEP Gender Plan of Action

Kenya is a signatory to the International conventions and treaties such as Convention on the Elimination of all Forms of Discrimination against Women (CEDAW), Commission on the Status of Women and African Platform of Action, the East African Community (EAC), and the African Union (AU) among others. Many of the agreements lack mechanisms for tracking implementation of Government gender commitments e.g. the EAC and AU. Others have provisions for periodic reporting e.g. CEDAW (Republic of Kenya, 2005).

In 1995, the UN's Fourth World Conference on Women, held in Beijing, concluded that throughout the world women continue to have fewer options and opportunities than men. Unequal treatment of men and women, and their differentiated social and economic roles, has also led to higher levels of poverty for women than for men in many countries.

Achieving gender equity is an important reason for attention to women's and men's energy needs. Improving the effectiveness of poverty alleviation programs is another relevant consideration. The Millennium Development Goals adopted by the UN General Assembly include a target of reducing by half the number of people living in poverty by 2015. Access to affordable energy services is an essential prerequisite to achieving economic growth and poverty reduction. In order to achieve the global poverty reduction target, the distinct energy concerns of women and men need to be addressed through gender sensitive policies and programmes.

1.3 Overview of gender perspectives on energy in the developing world

Of the 1.3 billion of the poorest people in the world, 70% of these are women. These people are energy poor, in that they have an absence of choice in the energy they access or use in their daily lives. Biomass plays an enormously important role in the lives of the rural poor in developing countries, in the form of wood for cooking and heating. But it is not just the poor in the rural areas that struggle. Centralised energy production is expensive and most poor urban households cannot afford to pay for electricity for most of their needs.

The concept of gender neutrality has been applied to energy service planning, assuming that women and men have the same needs for energy services. Such gender blind planning is now becoming exposed as unsustainable and efforts are being made to redress these issues. For example, ENERGIA, an International Network on Gender and Sustainable Energy recognises that:

- Women and men have different roles in the energy system: women bear the main burden of providing and using fuels (dung, raw biomass) for cooking. A situation made worse by fuel scarcity and negative health and safety impacts (such as indoor air pollution, which kills an estimated 1.5 million women and children in the developing world each year - see the recent WHO warning).
- Women bear the invisible burden of the human energy crisis – their time and effort in water pumping, agricultural processing and transport. They need modern and more efficient energy sources to improve their work and quality of life both within and outside the home.

- Women have less access than men to the credit, extension, land and training, necessary for improving energy access to support their livelihoods and income generation from micro enterprises.
- Women and men have different kinds of knowledge and experience of energy, either through their traditional roles, their new traditional roles or increasingly as professionals in the energy sector.
- Since women experience poverty differently to men, they may need different energy policies to help them escape energy poverty: new energy technologies can even have unintended negative consequences for women, as has happened in the past with other technologies.

1.3 Gender, energy and poverty linkages

The energy-poverty nexus has distinct gender characteristics. Within households, where there are adult men and women, the gendered division of labour generally allocates to women the responsibility for household energy provision. They are often supported in this work by girls and sometimes boys, who can be kept out of school thereby damaging their own future livelihood choices. Men become involved in places where large quantities and pieces of wood need to be transported over long distances.

In Kenya, society has assigned roles, access and ownership of resources along gender lines. This therefore allocates the responsibility for household energy provision to women. Women are the main collectors, producers and users of household energy. The most prevalently used form of energy is biomass. Often times, this is used in inefficient three stone fires. As a result the working environment is smoky which exposes women and children (largely below 5 years) to Indoor Air Pollution (IAP), predisposing them to acute respiratory infections, (ARI), Tuberculosis (TB), low birth weights etc. Improved wood burning stoves are only accessible to 4% of the rural households. There is also restricted decision making within households and community for women thus limiting their ability to influence processes and resource allocation to meet needs such as energy. As a result, supply of energy is constrained and important services for households are affected (e.g. Provision of water, involvement in productive enterprises etc).

It is recognized that over 2 billion people throughout the world rely on traditional fuels, such as wood, charcoal, dung, and agricultural residues, for cooking and heating. Access to electricity in Kenya is only to 15% of the households in rural areas and 4% in urban areas, and less than 1% use it for cooking. The remaining households rely on traditional fuels for cooking and heating.

Energy poverty, a situation where energy service is not available to a household or any other consumer in the desired form and quantity is a problem that has a disproportionate effect on women and girls, especially in rural areas. The most obvious factors relate to time and physical effort, where long hours are spent while gathering fuel. As fuel becomes scarce due to over-harvesting, land clearing or environmental degradation, many women in fulfilment of their reproductive gender roles, are forced to travel farther and spend more time and physical energy in search of fuel.

Modern forms of energy are widely seen to empower humans in countless ways: by reducing drudgery, increasing productivity, transforming food, providing illumination, transporting water, fuelling transportation, powering industrial and agricultural processes, cooling or heating of rooms, and facilitating electronic communication. At the same time, provision of energy to households to reduce poverty and hunger also benefits women who are freed from drudgery of collecting firewood, while children have better chances of learning with adequate light for longer hours (Johansson and Goldemberg (UNDP[2], 2002)

The limitations on the availability of energy services create barriers to socio-economic development. Without access to modern forms of energy for lighting, cooking, heating and cooling, refrigeration, pumping, transporting, communication and productive purposes, people must spend much of their time and physical energy on basic subsistence activities. The lack of energy services is correlated with many of the elements of poverty such as low education levels, inadequate healthcare and limited employment possibilities. At the local and national levels, a reliable energy supply is essential for economic stability and growth, jobs, and improved living standards.

Extension of the benefits of development to all people, men and women, is a fundamental fulfilment of the social equity objectives of sustainable development. With regard to energy, the Beijing Platform of Action called on governments to support development of equal access for women to sustainable and affordable energy technologies. The traditional role of women in household energy acquisition makes them most vulnerable to the effects of environmental damage and increasing scarcities of traditional fuels. Furthermore, the deterioration of natural resources reduces opportunities for income-earning activities and greatly increases women's unpaid work.

In analyzing energy and poverty in rural areas, the most important element is biomass energy, which accounts for the largest share of energy consumption by the rural households in Kenya. As fuelwood scarcity intensifies in many rural areas, the local women are finding their domestic chores increasingly difficulty. They are compelled to walk longer distances. In desperation, women are turning to potentially toxic options like cow dung, agricultural wastes, old plastic containers, which are injurious to their health and could accentuate respiratory illnesses due to persistent exposure to smoke. In short, lack of energy plays a major role in perpetuating poverty among the local population groups, who have to depend heavily on firewood to satisfy their domestic energy needs. The solution to this lies in the development of renewable energy, which has the potential to address the spatial and varied nature of rural energy demand.

2.0 Bioenergy access and delivery systems

Bioenergy is the commonest source of energy in Kenya. It is noted that problems relating to environmental degradation, land clearance, overgrazing, deforestation, drought and desertification are placing more and more pressure on dwindling Bioenergy resources.

[2] UNDP, 2002: Energy for Sustainable Development: A policy agenda. Sweden, UNDP.

Energy poverty is therefore a rapidly emerging phenomenon. Moreover, energy poverty is closely correlated with economic poverty. For instance, lack of energy heightens vulnerability to external shocks and limited energy resource means fewer choices, particularly for the poor. This therefore implies that ineffective household energy supply strategy undermines poor peoples' access to energy services.

2.1 Biomass

Biomass fuels are the largest source of primary energy in Kenya with woodfuel consumption accounting for over 68% of the total primary energy consumption particularly for rural households and cottage industries.

The current biomass demand is estimated at 40.5 million tonnes against a sustainable supply of 16 million tonnes (NEMA, 2005). This is mainly used by rural households and peri urban populations. Also, the rural-based cottage industries and service sector consumed 8.3% of the total firewood and 17.3 % of the total charcoal produced. The rural cottage industry entails a range of production and processing activities including: brick making, tobacco curing, milk processing, fish smoking, jaggeries, posho mills and bakeries, among others, while the services include hotels and restaurants. With regard to the use of firewood and charcoal in small scale establishments, gender differentiation in terms of respective gender levels of involvement is more apparent in the cottage industry activities. This is because women form the majority of the rural population. As a result, they operate most of the rural cottage informal businesses.

About 2% of Kenya's land area is covered by forests, which produce about 45% of the biomass energy resources including wood wastes. The balance is derived from farmlands in the form of woody biomass as well as crop and animal residues. There is widening gap between supply and demand for woodfuel.

A comparison of the sources of fuelwood for household consumption in 1980 and 2000 shows that in 1980s, the main sources were agricultural land 47 %, gazetted forests 25 % and rangelands 28 % , while in 2000, the main sources were agro forestry 64 %, trust land 8 %, gazetted lands 8 % and purchased outside the household 20 % . This is discussed in further detail below.

Although there are apparently large wood volumes available from the various vegetation types in the country, not all of it is accessible for energy. Accessible wood depends on a number of factors: legal issues, environmental issues, ownership, objectives of management, distances, infrastructure and quality of materials. In a broader sense, the sources of biomass for energy are further broken down into individual private farms, closed forests, plantations, farm residues, wood wastes and biogas, among others.

Only about 5% of the potential wood volume in closed forests is accessible for wood energy. Ownership of forested areas is also important and determines control and access. Communities in semi-arid and arid areas freely use wood for fuel, for the production of charcoal and for construction poles. Access to woodlands, bushlands and wooded grasslands is much higher than access to closed forests at approximately 30%. Grasslands where woody vegetation is scattered are about 10% accessible to surrounding settlements. Trees on farm and private estates are 100% accessible to their owners, but only about 90% is available for fuelwood (Kamfor, 2002).

2.2 Charcoal

Charcoal production is principally commercial and most of the resource emanates from forests being converted to agricultural land mainly in rangelands and trust lands such as in Kajiado and Kwale districts. Despite the high consumption, production is illegal; hence the production kilns used are traditional, with very low efficiency. Prices vary widely according to production zone, season and location of demand. People in urban centres use more charcoal than rural folk; 30.2% and 7.7% of households, respectively (nationally—13.3%). Among the demand drivers in urban areas are domestic cooking and *'nyama choma'* (charcoal-grilled) meat eateries. On average, the urban charcoal consumption was 156kg and 152 kg per capita (year 2000) for rural and urban dwellers respectively. Contrary to the popular view that charcoal is a fuel for the low income urban dwellers, 83% of high income groups regularly use charcoal (Kamfor, 2002).

2.3 Farm residue

Farm residue is used as a source of fuel particularly in areas where energy demand exceeds supply and in certain seasons when wood supplies are limiting. The quantities of residues are dependent on yields of the particular crop and proportional to the area planted. Residues are 50% accessible to the farmer as a source of energy.

Nationally about 21% of households use farm residues but their use is mainly in rural areas with 29% of the households as compared to 0.5% of urban households. Farm residue is mainly used for cooking (97%), water heating (46%), ironing (5.5%), lighting (3.3%), and home business (1.2%) Only 2.5% of households reported using wood waste comprising of wood shavings, sawdust, timber rejects, and off-cuts. Major uses of wood waste are cooking (96%), water heating (60%), Lighting (8%), and home business (6%) (Kamfor, 2002).

2.4 Modern Bioenergy supply options

The modern bio-energy technology covers a number of technological areas including: (i) Biomass powered electric power plants (Combined heat and power, CHP); (ii) Liquid biomass fuels: bio-ethanol and bio-diesel; (iii) biogas production technologies; (iv) Gasification and (v) Improved efficiency cookstove technology.

In the biomass sub-sector, there is widespread drive towards the modern biomass fuels including biodiesel, ethanol, biogas, cogeneration, and electricity from biomass gasification, among many others. If successfully tapped, these emerging biomass fuels will form an important key to future biomass utilization for energy to meet the needs for the poor rural women and men. According to Republic of Kenya, (2005), the lack of electricity in rural areas where most women live is an added hindrance to access to useful information which can help them know where to sell their produce, market prices for various products, among others.

Renewable energies have a great potential to contribute to gender equity so that women and men benefit fairly from access to energy services. Exploitation of modern biomass fuels can

potentially increase access to modern energy services resulting in various positive impacts such as: freeing the woman's time from domestic tasks, permitting home study and reading, enabling access to educational media and communications in schools and at home, mitigating the impacts of indoor air pollution on women, allowing access to better medical facilities for maternal care including refrigeration and sterilization, and enhancing income generation activities. All these activities contribute to improving gender equity (Clancy et al, 2004).

From a national point of view, modern biomass energy supply options should be able to conveniently meet the practical, strategic and productive energy needs of men and women. Examples of the practical gender needs that can be addressed by adequate supply of energy services include: water pumping, grain milling and lighting to improve working conditions. On the other hand, adequate energy supply services help to address the productive gender needs such as increasing income generating activities, refrigeration of food for own consumption and sale. The strategic needs addressed when energy is supplied makes streets safer (street lighting) to allow women to participate more and in greater numbers in evening activities, for example evening classes and social activities, among many others. The form and type of energy services available leads to differentiated gender impacts and outcomes. Modern biomass energy supply options are discussed below.

2.4.1 Biogas technology

The use of modern biomass energy in Kenya takes the form of biogas for cooking and lighting and improved charcoal and fuelwood stoves. According to a survey carried out by Kamfor (2002), 1100 biogas plants are in operation in Kenya. Most of these systems are between 4-16m^3 with a maximum gas capacity of 3m^3 which is considered sufficient to meet the cooking and lighting needs of a family of 5 persons. The production and sale of improved efficient biomass burning stoves is well established in the main urban centres, particularly the KCJ (charcoal stove).

Biogas technology diffusion has been slow over the years. According to recent studies (Kamfor, 2002); out of the currently estimated 1100 systems installed in Kenya, about 30% are not in working condition. The notable causes are poor design and construction, low end-user awareness on system management and lack of standards to govern the sector. The most notable biogas promotion effort was in the 1980s by GTZ and MOE. The uptake declined after the project ended in the early 1990s. It however notable that a renewed enthusiasm is building up for accelerated biogas installations in the country.

Modern biomass technologies such as biogas have the potential to provide improved energy services based on available biomass resources and agricultural residues. The availability of low cost biomass power in rural areas could help provide cleaner, more efficient energy services to support local development, promote environmental protection, provide improved domestic fuels and improved rural livelihoods (Karekezi, *et al*. 2004). This addresses household energy needs especially for women.

However, while the potential of renewable energy technologies such as biogas to reduce drudgery, freeing time and increasing productivity are well known, the accruing benefits are not necessarily evenly distributed. For example, there is merit in Denton's argument that

even biogas systems have often not lightened women's work load, and in some cases have increased it, by the need for a daily addition of dung and water which have to be head loaded (Denton, 2002). In a nutshell, there is credibility in the argument by Clancy et al (2004) that if the renewable energy sector wishes to contribute to development, it has to take a more holistic view and a good starting point would be to use gender analysis to gain an understanding of energy needs and the context in which they are operating.

2.4.2 Improved efficient biomass burning stoves

Improved cook stoves can do much to reduce the pollution levels in the kitchen, as well as giving cleaner kitchens. They also reduce women's work burden and gives them a sense of modernity and increases their sense of wellbeing. However, buying such a stove or attending a course to build your own stove requires access to and control over own income or a sympathetic husband.

At household level, the promotion of improved efficiency end-use devices, such as improved stoves, has been undertaken in Kenya. Current penetration of improved charcoal stove is estimated at 60 % of the rural households. There is potential to increase the penetration level. The current improved stove dissemination, according to AFREPREN (AFREPREN, 2006) is 3,136,739 stoves. This penetration is mainly for the improved charcoal stove which is used by urban households. The level of penetration of improved efficient woodstoves for the rural households is still below 5 %, yet there is enormous potential.

It is recognized that for about 26 years now, the energy policy measures in Kenya have centred around implementation of stove programmes that are meant to reduce the time spent by women in looking for cooking energy as well as reduce indoor air pollution among women and children in addition to other benefits.

Generally conservation efforts have positive gender impacts. Stove dissemination has also been demonstrated to be an income generation activity. Women groups in particular have been active in improved stove production and marketing. For instance, involvement in improved stove production and sale has helped members of Keyo Women's group in Kisumu to change their lives economically as detailed below:

> *The Upesi project was initiated in 1995 to promote the adoption of more efficient stoves in rural areas of Western Kenya. Its goal was to improve living and working conditions of women in rural households by enabling a significant and increasing number of women and families to benefit from fuel-saving wood-burning stoves. The project has cooperated with women's groups and involved them in design and field-testing of the stove. The women have been trained in producing, distributing, and installing the stoves. Additionally, their marketing and business management skills have also been improved. Thus, their ability to earn their own income from stove-related activities has increased. Production is estimated at 11,000 stoves annually; the profit generated by the stoves is comparable to wages in rural areas. The benefits to men and women in the project areas include improved health and time savings for users of the energy efficient stoves, as well as relief from pressures caused by fuelwood shortage. The women potters have gained in status, self-confidence, and financial independence (ITDG, 2001)*

2.4.3 Biofuel production

Production of liquid biofuels requires an intensive use of resources and inputs to which smallholder farmers (particularly female farmers) may traditionally have limited access. These resources include land and water, plus chemical fertilisers and pesticides to which women do not readily have access. In most developing countries Kenya included, there are significant disparities particularly in land ownership. In addition, women, due to the fact that they cannot use land as collateral, generally lack access to formal credit schemes thereby limiting their ability to acquire such productive inputs (FAO, 2004). Therefore, female headed households, in relation to male-headed households, might face more barriers to participating in biofuels production. The economic development and income-generating opportunities created by the increasing demand for biofuels might in the beginning benefit men (and male-headed households) more than women and (female-headed households), due to underlying differential access to resources (FAO, 2008).

Liquid Biofuel production can also contribute to marginalisation of women and female-headed households should so called “marginal” lands from which they obtain fuelwood, food and fodder be put under Biofuel cultivation.

Although the use of Biofuel is yet to take root in Africa, there are fears that farmers might shift from growing food crops whose prices have remained low to biofuels which are currently attracting high prices in the world market. Bioenergy includes all agro-energy and wood energy resources. The former includes crops specifically grown for energy, such as sugarcane, cassava, sorghum, maize, palm oil, oilseeds and various grasses. Other agro-energy resources are agricultural and livestock by-products such as straw, leaves, stalks, husks, shells, manure, droppings and any food and agricultural processing and slaughter by-products (Mbuthi, 2008).

Small-scale Biofuel production for local use could provide a solution to widespread energy poverty in rural areas of developing countries where there is very limited access to modern energy sources. It can also provide much-needed local, sustainable sources of energy for electrification, enterprise development, relief from burden of fuel collection, more time for families, education and rest (Carlsson, G, 2008). For example, in Kenya, production of the illicit local brew “*changaa*” as an energy resource is an option that would have positive gender impacts considering that the majority of producers are women.

Sustainability factors for small scale production include:

- Easily propagated crops suitable for local climate, temperature and water availability
- Crops that can grow on marginal and arid land with limited inputs and investment
- Non-competing with food crops
- Potential for a variety of income-generating by-products
- Policy support for rural market development and mobilisation of financing

- Emphasis on capacity building and training to provide opportunities for women to benefit.[3]
- Environmental sustainability
- Social dimensions

3.0 The gender perspective of Bioenergy supply options

In many contexts, it is women who suffer most from conditions of extreme poverty. Of the 1.2 billion people living on the equivalent of one dollar a day, 70 percent are women. In the traditional society, collection and use of biomass fuels is the responsibility of women and children. Men only get involved when these activities get commercialized. Due to diminishing biomass energy supplies, the time and physical effort expended by women and girls in gathering fuel and carrying water seriously limits their ability to engage in educational and income-generating activities.

The prevailing social structures including the land tenure system in some situations also inhibit access to biomass fuel by women. In addition, the use of low quality energy supplies and inefficient conversion devices pose health risks to women due to indoor air pollution.

Because of their traditional responsibilities for collecting fuel and water, women and girls would benefit the most from access to improved energy services. Literacy rates and school enrolment levels are dramatically different for men and women in many developing countries, Kenya included. Much of women's time is taken up with difficult and time-consuming chores related to producing and processing food without mechanical or electrical equipment and to cooking without clean-burning fuels and energy-efficient appliances.

The term "equitable access to energy services" has non-trivial gender connotations in the energy sector in Kenya because access to energy cannot be seen to be just and fair if a large constituency, such as represented by women (about 51% of the population), is either excluded or marginalized relative to male gender. In a patriarchal society such as we have in Kenya, the property rights system is discriminatory to women. This has adverse implications on access and control of productive economic resources, including energy, by women. For instance, while traditional societies "expect" women to fetch energy for household cooking, drying and heating, women have no control over energy resources such as firewood and charcoal because land "belongs" to men (Mbuthi, et al, 2007).

Many women and girls also suffer from health problems related to gathering and using traditional fuels. In addition to the time and physical burdens involved in gathering fuel, women suffer serious long-term physical damage from strenuous work without sufficient recuperation time. Women must worry about falls, threats of assault, and snake bites during fuel gathering. They are also exposed to a variety of health hazards from cooking over poorly ventilated indoor fires, including respiratory infections, cancers, and eye diseases.

[3] From "Small –Scale Production and Use of Liquid Biofuels", DESA 2007, www.UN.org/esa/sustdev/csd/csd15/documents/csd15_bp2.pdf

Smoke from poorly ventilated indoor fires accounts for close to 2 million premature deaths per year.

Reduced drudgery for women and increased access to non-polluting energy for lighting, cooking, and other household and productive purposes can have dramatic effects on women's levels of empowerment, education, literacy, nutrition, health, economic opportunities, and involvement in community activities. These improvements in women's lives can, in turn, have significant beneficial consequences for their families and communities.

In terms of gender disparities, available literature indicates that female heads of households constitute a higher proportion of the poor both in the rural (54.1% female vis-à-vis 52.5% for male heads) and urban areas (63.0% female vis-à-vis 45.9% for male heads). Also, female headed households rely more on the fuelwood than the male headed households. For instance, 81 percent of all female headed households used firewood compared to 68.1 percent for males. This implies that the increasing biomass supply deficit is impacting much more adversely on female headed households and is likely to further deepen their poverty situation (The 1999 population and Housing Census the Popular Report Aug 2002).

According to Kenya population census 1999, usage of firewood at provincial level showed higher proportions of female-headed households using firewood than those headed by men. An exception was North Eastern province where proportions were higher for households headed by women. The majority of the communities in this province were nomadic, and women are often left at home as household heads. In Nairobi province, as expected, firewood was rarely used; hence, paraffin/ charcoal were the most common, with households headed by men reporting higher proportions used than those headed by women.

A closer scrutiny of gender disparities within the household on the basis of who heads the household reveals that female headed households rely more on the fuelwood than the male headed households.

It is noted that a situation of scarcity exists amidst plenty in the sense that many women are unable to utilize fuelwood obtained from the trees growing on their farms because they need permission from their husbands who work away from home. This is clearly a situation of limited access to family resources despite the fact the woman has the responsibility of providing cooked food for the family at whatever cost. They end up scavenging around the homestead for every available twig that can be utilized. What may be previously viewed as a land or property issue is translated into and energy issue. It is necessary to address such disparities such that the family can access available firewood on the family and farm whether the man of the house is present or not. There is need to increase women's access, control and management of affordable fast growing trees for fuelwood.

Women's specific contribution in energy decision making is not explicitly recognized. Males at policy and technical and professional levels also dominate energy sector. For example in the renewable energy Department of Ministry of Energy, there is only one female professional against 20 males.

4.0 Key gender issues

4.1 Bioenergy and Indoor Air Pollution

Traditional biomass energy sources continue to dominate the rural energy supply, now and in the foreseeable future. The resource is fast diminishing and thus precipitating a growing demand supply imbalance. The continued dependence on traditional biomass is not without considerable social and health implications. There is drudgery as well as intensifying cases of indoor air pollution-related morbidity. The biomass supply deficit further leads to women and girls having to travel longer distances to collect firewood or turn into using lower grade fuels, further impoverishing their health.

Over 70% of Kenya's households rely on biomass as the primary source of domestic energy. Burning biomass to provide energy for cooking and space heating is in most cases done in very inefficiently and poorly ventilated kitchens using inefficient three-stone fires. Smoke emission from burning of biomass (wood, charcoal, agricultural residues, and dung) is largely particulate matter and other invisible hazardous emissions, including, carbon monoxide, nitrogen dioxide sulphur oxides, formaldehyde, and polycyclic organic matter, including carcinogens such as benzo [*a*] pyren, including dioxins.

Exposure to indoor air pollution, especially to particulate matter, from the combustion of bio fuels (wood, charcoal, agricultural residues, and dung) has been implicated as a causal agent of respiratory diseases in Kenya. Other diseases associated with IAP include chronic obstructive pulmonary disease (COPD), asthma, cancer of the nasopharynx and larynx, tuberculosis, perinatal conditions, low birth weight, and diseases of the eye such as cataract and blindness.

Poorer households may have additional susceptibility to disease as they use more polluting sources of energy for cooking and live in poorer housing conditions. Though a range of social and cultural factors influence household energy technology choices, income is still an important determinant of exposure. Women and children are the main victims to IAP health outcomes since they stay longer near fireplaces cooking. In urban areas households in informal settlements continue to reap the highest burden of IAP related health effects.

Women and children are more exposed to biomass based indoor air pollution. The rural poor including women do not have access to affordable clean energy. Continued dependence on biomass for cooking and lighting disproportionately predisposes women and children to health hazards of indoor air pollution, drudgery. Traditional biomass energy (wood, dung, crop residues) is associated with indoor air pollution and its increasing shortage causes drudgery to women owing to their traditional role as providers of household energy. There is mounting evidence that the resulting air pollution increases common, serious health problems, including childhood pneumonia and chronic lung disease. Baseline monitoring of pollution in kitchens in Kajiado and West Kenya by Intermediate Technology Development Group (ITDG) showed that smoke levels were unacceptably high: in Kajiado, the 24 hr average of respirable particulates was 5526µg/m^3 and in West Kenya, the levels were 1713µg/$m^{3.}$ If one compares these values to the EPA standards for acceptable annual levels of respirable particulates of 50µg/m^3, it can be seen that the daily rates (which are comparable, in these societies to the annual rates) are over one hundred times greater in Kajiado and twenty times greater in West Kenya than the accepted values. This means that

policies that enable households to move away from dependence on traditional biomass can help reduce the associated drudgery and health hazards on women.

The burden of IAP persists in Kenya due to a number of reasons. Poverty levels in Kenya make cleaner fuels unaffordable to the poor households leading to use of dirty fuels. Poverty also results in poor housing with poor airflow affecting proper ventilation, and overcrowding.

4.2 Energy Access and Availability

Due to historical biases in access to economic and other resources, women are economically less endowed than men and therefore technologies that emphasize economic and financial sustainability are less accessible to women. In addition, due to the settlement characteristics of rural domestic households in Kenya, most of the energy supply options that would best address energy access challenges facing women are not financially and economically competitive. As a result they use lower end of the value chain energy supply options that have adverse implications on the environment. The prevailing social structures including the land tenure system in some situations also inhibit access to biomass fuel by women. In addition, continued dependence on biomass for cooking and lighting and use of inefficient conversion devices disproportionately predisposes women and children to health hazards of indoor air pollution and drudgery.

Due to current poor economic performance, there is an increasing level of household poverty, which affects the purchasing power of the rural and urban poor, who mostly earn less than a dollar a day. As a result, poor households tend to depend on the most readily available energy options, which in the Kenyan case is biomass.

In Kenya, collection of fuel wood is largely free in most areas with some people paying for it where there is acute scarcity. Charcoal is widely produced illegally and commercialised through the informal market where 91% of the users are estimated to buy charcoal. There is a growing active market for fuelwood trading in the urban areas with all the wood consumed being bought while only a small percentage of fuelwood is commercially traded in the rural areas. Different gender groups benefit differently from fuelwood trade while changes in pricing of fuelwood affects gender groups in society.

There is a large deficit in almost all areas of the country with a total biomass deficit estimated at 20million tonnes representing a 57% shortfall in biomass supply, putting the entire country into an acute scarcity category[*]. Regions with a deficit include Central, Nyanza and Western Provinces of Kenya, while Tana River, Wajir, Isiolo, Marsabit, Narok, Laikipia and Samburu have little biomass surplus, which is attributed to low population and existence of large tracts of rangelands

KAMFOR Report estimates that the current biomass deficit of 20million tonnes will increase to 33.9 million by the year 2020 if no significant policy measures are taken. This is mainly due to the increase in the population (approximately 45 million by 2020) that will largely rely on fuel wood and charcoal.

[*] According FAO classification, areas with more than 35% deficit are in an acute scarcity situation

There are several constraints to increasing supply of wood fuel. These include scarcity of land for reforestation, woodlots and agro forestry, due to competing land use claims; unfavourable weather conditions; insecure land tenure; lack of awareness on forest regrowth and redevelopment; lack of fast growing tree species for fuelwood; unsatisfactory economic turnover; low rates of return and the time factor in investing in trees for fuelwood. From a gender perspective, although increased time to collect biomass for household needs could be addressed by planting trees for fuel, women do not usually own land and where they have access to land, they may not have control over what is planted.

While the policy indicates that lack of a favourable legal framework for charcoal production, distribution and marketing is one of the factors affecting development of the woodfuel sector, it does not show how the lack of the presence of the framework would affect the different gender groups involved in the trade.

According to Denton (Denton, 2005) energy poverty can be so pervasive that the choices would seem so few and some times above the means of rural communities. Such situations are not hard to find in certain parts of the country, including the refugee camps. Under such circumstances, women are literally condemned to an unenviable future of endless searching of fuel. At the extreme fuelwood scarcity, the responsibility of collecting fuelwood gradually shifts to children, who have no choice but to glean for any available stick wood on the roadsides. Ultimately, women are left juggling multiple roles most of which are contingent on the provision of energy. Moreover, the gender asymmetries and divisions of labour which have historical, societal and cultural roots have resulted in unequal and exacerbated impoverishment in the contemporary rural development arena. Biomass shortage increases drudgery for women. There are health implications on women walking long distances to collect firewood.

4.3 Energy pricing

At the national level, decisions about access to energy supply are male dominated. Income disparities exist between men and women. Most rural women have limited economic control at the household level while men control household income. When energy has to be purchased, men enter the energy the decision-making process. This means that energy pricing will impact men and women differently.

It is necessary to enhance women's ability to afford to utilise different forms of energy, particularly the cleaner biomass forms and to develop economic incentives for investment in different forms of energy development. There is need to promote equitable access and use of modern biomass sources especially the emerging ones at affordable rates to address the energy needs of the poor.

From an economic point of view, pricing of domestic fuel affects women because they are mainly responsible for the fuel procurement. Pricing should therefore promote efficiency of energy use and promote substitution between alternative fuels in forms that promote women's participation in productive end uses.

Hidden subsidies are provided in the electricity, kerosene and liquefied petroleum gas sectors but majority of Kenyan's still lack access.

Among policy issues arising under energy pricing is the fact that the pricing process is informed by principles of fairness and equity for the benefit of both the producers and consumers. The pricing policy for woodfuel for example states that when licensing commences, license fees will reflect the environmental costs associated with woodfuel harvesting to ensure sustainable exploitation. It is however not indicated how this measure will take care of gender concerns.

5.0 Policy dimensions

Women in Kenya provide the bulk of energy services at household level often with serious consequences on their health. While they supply the bulk of the energy for cooking and heating, they do not participate in commercial energy production. Poor women derive their energy services from non-conventional energy sources including renewable energy. Support to local level if focused on renewable energy may provide women with both employment and new energy services.

The policy has tried to address to a certain degree of success the issues of energy access, availability, affordability and sustainability as elaborated below.

To address the foregoing biomass energy supply-demand imbalance the Government and collaborating organizations have adopted various strategies, namely: (1) Expanding the biomass supply through on-farm tree planting; and (2) biomass substitution and improvement of conversion and end-use efficiencies. The demand side management strategies pursued in the past and present, namely improved efficiency stoves and energy conservation are not able to keep pace with the depletion rate of the sustainable supply.

Rural energy focus proposed in Sessional Paper No. 4 on energy on reducing dependence on biomass through fuel substitution mainly with LPG will stimulate both on and off farm income generating opportunities and introduce clean energy in the households. This will address gender issues as it will largely remove the burden associated with collection, processing and use of biomass.

Some of the energy programmes implemented are geared towards shifting energy consumption away from traditional biomass to modern energy carriers including modern biomass fuels. While the strategies may ultimately help, their formulation and implementation are not engendered, meaning that the specific gender needs are not properly focused on. This may inherently constrain the achievement of full benefits envisaged.

There is over emphasis on commercial energy with lesser focus on household energy where women dominate. This out rightly negates women's participation and benefit from energy commercialisation

The Sessional Paper No. 4 on Energy recognizes the societal designated role of women as household energy providers and that due to decreasing quantities of biomass resources, women and children, usually the girl child, are spending increasingly longer hours fetching

for energy. This leaves limited time for women to engage in commercially rewarding engagements while it denies the girl child study time. As these and most of the other chores performed by poor women are not monetised and rewarded accordingly, this situation has aggravated the economic deprivation of women.

The Sessional Paper No. 4 on Energy also notes that existing cultural structures including the land tenure system in a number of communities inhibit access to biomass and other resources by women. In addition, the use of low quality energy sources coupled with inefficient conversion technologies pose health risks to women. It therefore calls for a deliberate policy to mainstream gender issues in policy formulation, energy planning, energy production and use. Moreover, the paper calls for a review of cultural barriers that hinder access to energy and other economic opportunities by women.

The energy policy objectives spell out measures to be undertaken in resolving energy supply in the country. The policy measures for biomass energy include enhancing research and development, streamlining the production and marketing of charcoal, increasing the rate of adoption of improved stoves, promoting inter-fuel substitution and promoting tree planting for energy production.

Bioliquids and biogas were recognized as key to shifting consumption from biomass during the World Summit for Sustainable Development held in Johannesburg in 2002. The rules governing international Biofuel trade should be agreed on and adopted, and the social and environmental sustainability of biofuels production should be ensured. A number of national and international initiatives aimed at ensuring the sustainability of biofuels production and processing are already under way, such as the International Bioenergy Platform, (IBEP) and the Global Bioenergy Partnership (GBEP, both housed within FAO, and the Roundtable on Sustainable Biofuels (FAO, 2008).

At the national level the current energy policy in Kenya recognises the role of biofuels and the inherent challenges. The prevailing high market cost of conventional energy sources such as fossil fuels provides an incentive for bioethanol programme to make economic sense now than was in the 1980s. It is noted that other developing countries such as Brazil have made great strides in the production of bioethanol for blending with petrol. Kenya can thus build upon the experiences elsewhere, being careful not to fall in the past pitfalls.

The current draft national strategy on biodiesel indicates that there is vast potential for the development and use of biodiesel as a renewable source of Bioenergy. In this direction, there is a rapidly growing awareness and interest for the planting jatropha curcas in suitable areas across the country. Jatropha is widely favoured as a source of biodiesel owing to its non-edibility as well as its ability to grow over a wide range of climatic conditions.

A biofuels strategy is under preparation in Kenya. A national Biofuels Committee to spearhead the preparation of the strategy was constituted in 2005. However, the emerging enthusiasm on biodiesel, particularly the planting of jatropha curcas, appears to overshadow the biofuels strategy which had been set up earlier. As a result, the biodiesel strategy is currently at more advanced stage of preparation even though it started much later (Mbuthi, 2008).

6.0 Gender related issues of Biofuel development

Despite the numerous positive attributes of Bioenergy as a renewable energy resource and environment friendly, there are some negative aspects and challenges which must be appropriately addressed before full scale Bioenergy interventions are implemented in Kenya.

Introduction of biofuels along the lines being advocated will create market based production thereby excluding women, as demonstrated by the historical exclusion of household energy in policy planning. In Africa, women are largely responsible for food production and there is not enough being produced to meet the needs. The Biofuel programmes being initiated will require land use changes that are anticipated to impact on food production and security, inequality and poverty. Further this will impact on food sovereignty (Declaration of Nyeleni, 27 February 2007) where by virtue of societal created roles for women, people will lose right and access to healthy and culturally appropriate food produced through ecologically sound and sustainable methods and their right to define their own food and agricultural system.[4]

If the Biofuel sector is driven in the wrong way it could cause greater poverty, through competition for land and thus rising food prices. Rapidly expanding Biofuel plantations for international trade raise serious human rights and food security issues. A UN Special Rapporteur on the Right to Food, Jean Zeigler (UN Doc, A/62/289), reports growing concerns about:

- Food shortages affecting the world's poorest people
- Increasing competition over arable land, forests, and natural resources, and possible evictions of small peasant farmers and indigenous communities
- Increased competition over water resources

Women are likely to be disproportionately affected by large-scale Biofuel production in regions where women are the ones primarily responsible for collecting fuel and water for household needs, growing food for their families, and gathering fodder, medicinal plants and wild food from the land.

The growing use of agricultural commodities for production of such fuels and the establishment of large-scale energy crop plantations might exacerbate the pre-existing competition for land between forests, agricultural and urban uses, leading to deforestation.

According to Lambrou and Laub, 2006, if biofuels production competes either directly or indirectly for water and firewood supplies, it could make such resources less readily available for household use. This would force women who are traditionally responsible, in most developing countries, for collecting water and firewood, to travel longer distances, reducing the time available to them to participate in decision-making processes and income generating activities.

Liquid biofuels derived from food crops may have different food security implications than modern Bioenergy systems based on waste materials. While local production of biofuels on a small scale can boost local energy production, as is the case with ethanol, the international

[4] http://www.foodandwaterwatch.org/world/global-trade/NyeleniDeclaration-en.pdf

market can completely destroy available opportunities for sustainable production. The consequences of growing Biofuel for export instead of growing food for consumption could be severe. In Kenya using potential agricultural land and water to grow Biofuel crops may have a detrimental effect on food security in a country that is already struggling to feed its people.

According to (FAO, 2008) the environmental and socio-economic transformations prompted by the growing global demand for liquid biofuels might have different impacts on men and women in developing countries. Men and women within the same household as well as male- and female headed households could face different risks, particularly with regard to their access to and control of land and other productive assets, their level of participation in decision-making and socio-economic activities, employment opportunities and conditions, and their food security. This reflects men's and women's different roles and responsibilities within rural economies, as well as per-existing socio-economic inequalities between them.

The question of tree species mismatching with climatic zones is a matter of concern. The failure of the tree-crops may potentially create a negative reputation of the crop and thus adversely impact on future acceptability and adoption.

Other concerns include the fact that women have limited legal rights including owning and controlling land; the fact that women have less access to credit and financing for enterprise development; that agricultural extension may not reach or benefit women farmers; that crops traditionally grown by women may be taken over by men when they are commercialised. Therefore, female-headed households might face more barriers to accessing the market for external inputs and thus participating in and benefiting from Biofuel production. Unequal rights to land create an uneven playing field for men and women (and male and female-headed households) who will not have the same opportunities to be involved in biofuels production and benefit from it.

7.0 Conclusions and recommendations

There is need to mainstream gender issues in policies formulation and in energy planning, production and use, undertake public education and awareness creation on the cultural structures and practices hindering the access by women to biomass fuels resources, undertake public health education on appropriate use of biomass fuels and promote the use of fuel efficient biomass cook stoves as well as alternative energy sources.

Promotion of green energy needs to be intensified and similarly, efforts to increase efficiency in the utilisation of all forms of energy should be intensified with a view to reducing pollution and improving environmental health. Efforts to promote environmentally friendly and higher efficiency energy should be intensified. Indigenous and environmentally friendly practices should be encouraged.

Policies for energy investments should target increasing access to energy for increased productivity and reducing drudgery for women as failure to invest in low cost energy supply systems condemns women to continue using firewood for cooking and lighting, with the associated health problems.

In order to ensure that liquid biofuels production benefits men and women in developing countries, Kenya included, policies should be adopted to reduce the potential environmental and socio-economic risks (with their gender differentiated impacts) of liquid biofuels.

The Biofuel strategies that are currently being developed and implemented in several countries around the world, mostly as part of broader climate change mitigation policies, should be gender sensitive. They should take into account the gender-differentiated effects of liquid biofuels production in order to maximise the potential synergies with other policies and their respective goals, such as sustainable development and gender equality (FAO, 2008).

Biofuel development policies should also be consistent with (and, possibly contribute to) the promotion of gender equality and empowerment of women. Measures should be taken to ensure that women and female-headed households have the same opportunity as men and male-headed households to engage in and benefit from the sustainable production of liquid biofuels. Ensuring equal opportunities for men and women would entail reducing pre-existing gender-based socio-economic inequalities, particularly in terms of access to and control of land, credit and productive inputs, as well as ensuring decent and equal employment opportunities and conditions for male and female plantation workers.

Modern Bioenergy provides opportunity to benefit women and men as it provides opportunities for entrepreneurship but there is need to design a strategy to incorporate gender issues from the beginning. There is need to put in place proper policies to support innovations and ensure that the poor are not left to compete for food. Strong and harmonised sustainability standards for Bioenergy need to be put in place to help promote energy efficiency and ensure environmental and social sustainability. All this should translate into improved access to affordable, reliable and sustainable energy for improved livelihoods.

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