Gender Issues in Biogas Promotion and Use in Kenya: A preliminary review

Working Paper No. 201

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

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Correct citation:

Wilkes A, van Dijk S. 2017. Gender Issues in Biogas Promotion and Use in Kenya: A preliminary review. CCAFS Working Paper No. 201. Wageningen, The Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Available online at: www.ccafs.cgiar.org

Titles in this Working Paper series aim to disseminate interim climate change, agriculture and food security research and practices and stimulate feedback from the scientific community.

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic partnership of CGIAR and Future Earth, led by the International Center for Tropical Agriculture (CIAT). The Program is carried out with funding by CGIAR Fund Donors, Australia (ACIAR), Ireland (Irish Aid), Netherlands (Ministry of Foreign Affairs), New Zealand Ministry of Foreign Affairs & Trade; Switzerland (SDC); Thailand; The UK Government (UK Aid); USA (USAID); The European Union (EU); and with technical support from The International Fund for Agricultural Development (IFAD).

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Acknowledgements

This work was implemented as part of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), which is carried out with support from CGIAR Fund Donors and through bilateral funding agreements. For details please visit https://ccafs.cgiar.org/donors. The views expressed in this document cannot be taken to reflect the official opinions of these organizations.

We also thank participants in the Kenya Dairy NAMA Gender Workshop convened by Kenya Dairy Board on 5 May, 2016 for their insights.

Contents

Acronyms

ABPP	Africa Biogas Partnership Programme
CCAFS	Climate Change and Food Security Programme of the CGIAR
IFAD	International Fund for Agricultural Development
KENDBIP	Kenya National Domestic Biogas Programme
NAMA	Nationally Appropriate Mitigation Action
SACCO	Savings and credit cooperative

1 Introduction

This review has been undertaken in the context of preparation of a concept note for the Kenya dairy NAMA. Biogas promotion is one of the project components. Mitigation actions should aim to achieve greater, more effective, sustainable, and equitable climate change results, outcomes and impacts; ensure that women and men have equal opportunity to contribute to, and benefit from supported activities; and mitigate against potential project risks for women and men arising from the supported activities.[1]

In order to ensure that the Kenya dairy NAMA is designed to address these objectives, with support from CCAFS, a process of inquiry has been launched involving stakeholders in the dairy and biogas sectors. This review contributes to that process by summarizing existing knowledge on gender issues in biogas promotion and use, and existing experience with addressing gender issues in biogas promotion initiatives. The focus is on household (domestic) biogas.

[1] GCF (2016)

2 Gender Issues in the adoption and use of biogas

2.1 Technical potential for biogas adoption in Kenya

An assessment of the number of households with sufficient available livestock waste and water estimated a technical potential for biogas adoption at 1.26 million households,[2] but a subsequent study with more detailed cattle population data suggested a technical potential of 320 000 households.[3] By comparison, actual numbers of installed biogas units are much smaller. Table 1 shows published estimates of installed biogas units in Kenya from different sources in different years. Most household digesters are between 4 to 16m^3 in size, with a few larger institutional or community units. Some recent reports of high numbers of installed biogas units appear to be inflated, possible because of the incentives to report high numbers related to subsidies that have been available until recently in one programme. The Kenya National Domestic Biogas Programme (KENDBIP), Africa Biogas Partnership Programme (ABPP) and a project under consideration by the World Bank's ClimDev Special Fund propose objectives of installing between 10 000 and 30 000 units in the coming 5 year period. Overall, progress has been slow until very recently, and there is a large theoretical potential for further adoption.

Table 1 Number of biogas units installed in Kenya

Year	1997[4]	2005[5]	2012[6]	2014[7]
Units Installed	1100	500	1884	4000-16 000

[2] Assuming 0.8-1 m^3, per day per household, requiring 20-30 kg fresh dung daily, i.e. 3-4 stall-raised cattle, using information on 'access to safe water' as a proxy for water availability

[3] Heegde and Sonder (2007)

[4] Practical Action (2010)

[5] Cited in Karekezi et al. (n.d.)

[6] Cited in Rajendran et al. (2012)

[7] SNV (2014) Biogas users survey 2014

2.2 Barriers to upscaling of biogas adoption in Kenya

Several overviews of the sector have reported barriers to upscaling biogas adoption in Kenya (table 2). In general, these factors relate to constraints affecting potential customers (e.g. lack of information, high investment costs), constraints affected biogas service providers, and regulatory issues (e.g. lack of standards) that affect the sector as a whole.

Table 2 Barriers to expansion of biogas adoption in Kenya

Source	Barriers
Practical Action (2010)	• High capital costs for biogas unit, modified burners and lighting units • Lack of skilled artisans to construct and provide maintenance services
ETC Group (2007)	• High costs of installing the systems • Lack of sufficient technicians/artisans • High failure rate in the past/sub-optimal performance • Inadequate post installation support • Poor management and maintenance (because of household labour constraints) • Many potential users of the technology are not aware of the technology • Lack of quality control and standards

In addition, there are different risks and constrains affecting specific biogas product designs (i.e., technology factors; see text box 1). With the fixed dome and drum models, improper maintenance and broken parts can lead to abandonment. With the flexible bag model, damage to the plastic sheeting is the main risk. One study found that fixed dome units were more likely to be in operation and have fewer repairs than floating drum units or flexible bag units, and were more likely to be perceived as reliably providing sufficient volume of gas.[8] However, an evaluation of 500 flexible bags improved and promoted by IFAD showed that the vast majority are still working and that development benefits have been significant.[9] Table 3 summarizes some of the characteristics of three common biogas types.

[8] Mwirigi et al. (2009)

[9] Sovacool et al. (2015)

Text Box 1 Common biogas technology designs in Kenya

The *fixed dome* model has a main digester made of brick and cement in which the organic inputs are collected and anaerobically converted into methane. Connected to the digester there is an inlet tank in which the inputs get mixed with water prior to feeding into the digester; and a compensation tank where the by-product (bio-slurry), gradually accumulates until it overflows to a composting pit.

The *floating drum* model has an underground well-shaped digester with inlet and outlet connections through pipes at its bottom on either side of a partition wall. An inverted drum (gas holder) is placed in the digester, and rests on the wedge shaped support and guide frame at the level of a partition wall. This drum can move up and down along a guide pipe with the accumulation and disposal of gas. The weight of the drum applies pressure on the gas to make it flow through the pipeline to the point of use.

Prefabricated plastic tube models have also recently begun to be used. The tube is constructed of inter-locking segments that allows a modular design such that digesters can be anywhere from 2 m3 to 20 m3 in size.

In the *flexible bag* model, the substrate flows through a tubular polyethylene or PVC bag (the reactor) from the inlet to the outlet. The gas is collected by means of a gas pipe connected to a reservoir.

Table 3 Comparison of features of 3 biogas models

	Fixed dome	**Floating drum**	**Flexible Bag**
Cost (US$)	1,000	900-1,200	410-810
Lifetime (years)	20	10-15	15
Construction time (days)	20	20-25	1
Main materials	Masonry, wood	Masonry, steel gas holder	Plastics, PVC
Portability	Fixed	Fixed	Mobile
Manure required (tons)	5	5	1

Source: Sovacool et al. (2015)

We identified 8 studies that have specifically focused on the determinants of household adoption (table 4). These studies included 4 published papers (though not all of good quality), and 4 graduate theses (which made limited use of statistical methods to demonstrate their results). Commonly identified barriers to adoption include high initial investments relative to household income and lack of access to technical services or skills for construction. Several studies suggest that characteristics of the household head (i.e. education level, age and gender) are significant, but results are not consistent on these factors.

Some reports also suggest rates of disuse as high as 30%,[10] while others report low rates of disuse (5%).[11] Causes are attributed to poor design and construction, low end-user awareness on system management and lack of standards to govern the sector; low gas production; vandal-ism (e.g. of plastic tube technology), gas leaks and pipe blockages, lack of spare parts and technical support services. Furthermore, although biogas may replace other fuels, low gas production in the wet and cold months between April and July may force users to revert to their previous conventional fuel sources for some months of the year. Some studies report that biogas adopters continue to list wood as their main fuel source, suggesting that biogas may complement or partially reduce conventional fuel use, rather than fully replace conventional fuels.[12]

[10]Muchiri (2008); Wachera (2009); Kwamboka (2015)

[11]Wamuyu (2009)

[12]Ndereba (2013)

Table 4 Determinants of biogas adoption in Kenya

Source	Year	Region	Sample size	Adoption rate	Analysis Method	Main Findings
Mwirigi et al.[13]	2009	Nakuru, Nakuru North	200 hh (non-random)	-	Chi-square	Household socio-economic status significantly influenced the decision to adopt biogas, but did not influence the sustainability of the constructed plants.
Njoroge et al.[14]	n.d.	Lanet, Nakuru	364	21%	Descriptive stats	Adopters and non-adopters have a generally positive attitude toward biogas. Income is the main barrier to adoption.
Nguu et al.[15]	2014	Embu West	156 hh	9%	Chi-square	Knowledge of biogas increases positive perception, but not adoption. The main adoption barriers are: installation cost (31%), lack of technical knowledge (37%), and lack of trained specialists (14%).
Kyalo et al.[16]	2014	Kisii	50 adopters, 150 non-adopters	-	Chi-squre	Education, household size, gender of household head and cooperative membership are significantly related to adoption.

Inda et al.[17]	2015	Githunguri	66 hh (all adopters)	-	Multiple regression	Financial resources, technical skills, project management and policy are all perceived to influence adoption.
Wachera MSc thesis[18]	2014	Nyeri	120 hh	36%		Barriers to adoption include: high installation costs (70%), socio-cultural factors (46%), negative attitude towards biogas energy (17%), lack of interest (10%), inadequate skilled technicians (26%) and lack of credit facilities (70%).
Kwamboka MSc thesis[19]	2015	Kilifi	150 hh	6.7%	Logistic regression	Income, education and access to technical services influence adoption.
Wamumu PhD thesis[20]	2014	Kaimbu	325 hh	61.54%	Logistic regression	Farm size, age, education, gender of the household head and the number of cows owned are significantly related to adoption. Barriers to adoption include high installation costs (45%), requires large amounts of manure (18%), too labour intensive (14%), not aware (6.6%), do not understand how it works (5.6%).

2.3 Gender issues in biogas promotion and use

Men and women have different roles in the energy system. Women (including girls) bear the main labour burden of fuel provisioning, but often have less access to credit or income for investment in new energy technologies. As the main users of energy (e.g. for cooking) women also bear the main health burden related to energy use. Energy provisioning and poverty are closely related, as are poverty and gender, with disproportionate impact on women and girls.[21] The existing literature on gender issues in biogas in Kenya treats five questions:

(1) What are the gender issues in energy access?

(2) What are the benefits of biogas for women?

(3) How do gender issues affect adoption of biogas?

(4) How has gender been addressed in biogas dissemination initiatives?

(5) How is gender addressed in related policies?

Overall, the literature is sparse on each of these questions.

2.3.1 Gender issues in energy access

Cooking, lighting and heating are the most common energy needs of rural households, although some households also use energy for farm or household appliances.[22] Fuel wood is by far the most common energy source, followed by charcoal and electricity. Fuel wood (and to some extent charcoal) is the main source of energy used for cooking. Electricity and/or LPG/kerosene are commonly used for lighting. About 75% of households report that fuel wood is their main energy source. About 75% of households also report that the cost of energy is the main barrier to energy access, followed by constraints on the accessibility of energy.

[21] Muchiri (2008)

[22] Besck Holdings Ltd (2011)

A baseline survey for the national biogas programme found that men (including male spouse and young men) are more likely to be involved in purchasing or making decisions to purchase LPG, electricity and solar energy, while women (including female spouse and young women) are more involved in fuel wood, charcoal and kerosene procurement (table 5). Fuel wood resources are becoming increasingly scarce. This increases the time, labour and health burden of fuel collection, a burden mainly borne by women and girls. Dairy households consume about 11 kg of fuel wood per day, and spend about 166 hours per week on fuel wood collection and 384 Ksh. per week.[23] Reports of back pain are common (71%), as are reported health effects of exposure to wood smoke.[24] One study reported that female heads of households are much more likely than male heads of households to cite health effects of energy use as a concern.[25]

Table 5 Gendered involvement in collection or purchase of different energy sources

	Percentage of all respondents					
	Male Spouse	Female Spouse	Son	Daughter	Worker	Joint male & female spouses
Fuel Wood	18.3	33.2	16.3	3.5	26.2	2.5
Charcoal	22.8	32.5	24.4	4.9	10.8	4.9
LPG	36.4	25.0	13.6	2.3	13.6	9.1
Electricity	46.0	20.6	6.3	-	25.4	1.6
Solar	62.5	-	-	-	37.5	-
Kerosene	27.8	35.4	20.3	3.8	7.6	5.1
Biogas	15.0	-	10.0	-	75.0	-

Source: Besck Holdings Ltd (2011)

[23] Dohoo et al. (2013)

[24] Critchley et al. (2015); Dohoo et al. (2015)

[25] Besch Holdings Ltd (2011)

2.3.2 Gendered benefits of biogas adoption and use

Reported benefits of biogas adoption include: (i) reduced wood demand, [26] (ii) climate change mitigation, (iii) reduced energy costs, (iv) reduced exposure to indoor smoke, (v) reduced time, labour and health effects of fuel wood collection, (vi) agricultural benefits of biogas slurry use, and (vii) change in men's involvement in cooking. Several of these benefits have gendered dimensions.

Reduced health effects of indoor air pollution: Replacement of wood fuel reduces exposure to indoor smoke.[27] Women using biogas spend significantly less time (509 min/week) ex-posed to wood smoke compared with non-adopters (mean=1122 min/week).[28] One study in Kenya quantified that female biogas adopters reported less breathing problems compared to non-adopters (43% vs. 71%), less shortness of breath, less difficulty in breathing and less chest pain while breathing.[29] In addition, children born in households using high wood or charcoal as their main source of cooking fuel have higher mortality rates than those using low polluting fuels (including biogas).[30]

Reduced time, labour and health burden of energy provisioning: Women are often the main provisioners of fuel wood. Biogas users consume about 60-70% less wood fuel than non-adopters; biogas users spend about 65% less time (57 minutes per week) than non-adopters (166 minutes per week) on fuel wood collection; and fewer biogas user women report back pain (34%) than non-adopters (71%).[31]

Reduced energy costs: Biogas adoption significantly reduces cash expenditures on energy. A baseline survey for the national biogas programme reported that 88% of households re-ported a reduction in expenditures after biogas adoption. Of these, about 40% reported a decrease of 25% or more, and 55% reported a decrease of 50% or more.[32] Other studies also report savings of 60-75%.[33]

26

27 Subedi et al. (2014)

28 Dohoo et al. (2015b)

29 Dohoo et al. (2012)

30 Muttunga (2007)

31 Dohoo et al. (2013); See also Wamuyu (2009), pp. 74-5. 86-7

32 Besck Holdings Ltd (2011)

33 Dohoo et al. (2013); Wamuyu (2009)

Biogas use mostly replaces fuel wood in cooking, but may also be associated with increased use of electricity and kerosene.[34] Women are often mostly responsible for wood and kerosene procurement, while men may be mostly responsible for electricity procurement, although there are likely to be significant differences among house-holds in this regard. Fuel wood is often procured through labour, but may also sometimes be purchased. The net effects on women's use of cash resources for energy procurement are therefore not clear from the available data.

Biogas-slurry as fertilizer: Compared to animal manure, biogas slurry can make more nutrients available to crops if applied in doses.[35] Studies suggest that the potential yield increases could raise the financial profitability of investment in biogas.[36] Greater benefits may accrue if fertilizer is replaced or if bio-slurry is sold.[37] A baseline survey for the national biogas programme suggests that 78% of biogas users make use of slurry, mainly for composting (64%) and application on fodder crops (32%).[38] However, individuals involved in biogas promotion report that slurry often goes unused, and this represents a significant waste of opportunity to realise the full benefits of biogas adoption.[39] The gender-related aspects of slurry use and of its benefits have not been explored.

Change in men's involvement in cooking: Although not reported in the literature, several individuals involved in biogas promotion reported that after biogas has been adopted for household cooking, men are more likely to spend time in the kitchen and to use the biogas for minor cooking tasks, such as making tea.[40]

[34] Besck Holdings Ltd (2011); Ndebera (2013)

[35] Smith et al. (2014)

[36] Kebede et al. (2016)

[37] Hamlin (2012)

[38] Besck Holdings Ltd (2011)

[39] Dairy NAMA gender workshop, 5 May 2016, Nairobi

[40] Dairy NAMA gender workshop, 5 May 2016, Nairobi

2.3.3 Gender and biogas adoption and use

No study was identified that specifically addressed gender aspects of biogas adoption processes in Kenya.[41] Among the household adoption studies listed in table 4, some studies find that the gender of the household head is a significant determinant of biogas adoption, but not all studies confirm this. On the one hand there may be definitional issues around female-headship. For example, it is not clear whether a widow, divorced woman or women with a husband temporarily migrating elsewhere are affected by the same issues. Estimates of female-headship vary considerably. The baseline survey for the national biogas programme found that 13% of households were female-headed,[42] while other surveys report 20%[43] and a national survey reports a figure of 32%, with considerable regional variation.[44] On the other hand, the gender of the household head is often taken as an indicator for examining gender differences in survey responses, but there have been very few attempts to understand gender issues within households with both a male and female spouse present. Beyond the gender of the household head, gender is most likely a significant issue in adoption decisions for the reasons outlined below.

(i) Although women may be the main provisioner and user of energy (especially fuel wood and fuel for cooking), women are not necessarily the main decision maker in a household. For example, the national biogas programme baseline survey reported that of 150 biogas users, 57% of respondents indicated that the male made decision to adopt alone, while in 33% of cases, women were also involved in the decision.[45] However, one study in Kilifi estimated that less than 3% of adoption decisions were made jointly.[46]

[41] Mburugu (2012) looks at adoption by women of 'appropriate technologies' in general

[42] Besck Holdings Ltd (2011)

[43] Kassie et al. (2014)

[44] Kenya National Bureau of Statistics (2014). Highlights of the Socio-economic Atlas of Kenya. http://www.knbs.or.ke/index.php?option-com_phocadownload&view=category&id=116:the-socio-economic-atlas-of-kenya&ltemid-599

[45] Besck Holdings Ltd (2011)

[46] Kwamboka (2015)

(ii) Male household heads may not consider the benefits of biogas adoption, particularly the benefits for women, or may have different considerations and prioritization of concerns. For example, the national biogas programme baseline survey reported gendered differences in individuals' concerns around energy use. Specifically, while men and women had similar concerns about the reliability, efficiency and cost of fuel wood use, women were much more likely to be concerned about the health effects of fuel wood use.

(iii) Men often control the resources required for biogas adoption. In particular, land that would be occupied by biogas installations is most often owned by men. Land titles are also the main form of collateral used to obtain credit loans for biogas installation. Surveys of credit access generally report lower use of credit by women than men, particularly from credit sources that are able to give higher volume loans.[47] Even in female headed households, the household head must sometimes have to consult the sons or other male family member on major decisions.

(iv) Access to information is also a pre-requisite for informed decisions on adoption. Most studies find that friends, family and neighbours are the main source of information about biogas. Gender disparities in access to information may impact on adoption decisions. There is also no information on the impact of the gender of biogas company sales staff on adoption decisions, or of membership in women's groups on adoption decisions.

These situations may result in non-adoption of biogas even if women in the household are willing to adopt. A related conclusion has been reached for market-based extension of water pumps in Kenya.[48] Overall, there is a very little information on gender dynamics affecting biogas adoption decisions. However, the points raised above suggest that gender dynamics are likely to affect adoption decisions.

[47] Mburu et al. (2012); Rambo (2012)

[48] Njuki et al. (2014)

Similarly, gender dynamics are likely to affect continuing use and operation of biogas. The base-line survey for the national biogas programme reported that male and female spouses were responsible for operation and maintenance of biogas units in about one quarter of households with biogas, while in half of households with biogas, operation and maintenance were done by the farm hand (table 6). However, individuals involved in biogas promotion stated that while men are commonly involved in the decision to adopt biogas, once units had been installed, men were much less involved in their operation.

This may cause problems when, for example, biogas units fail, women reportedly ask their husbands to contact the company for repairs, but the men may not always do this, resulting in higher rates of abandonment.[49] Intra-household gender relations are therefore relevant both to sustained use of biogas and to the promotion of biogas, since perceptions of failure rates and risks are commonly reported as a reason for households not to intend to adopt.

Table 6 Division of labour in operation and maintenance of biogas units

Household member	Frequency (n=85)	% of total
Husband	22	25
Wife	18	21.4
Sons	2	2.4
Daughters	1	1.2
Workers	42	50

Source: Besck Holdings Ltd (2011)

[49] Dairy NAMA gender workshop, 5 May 2016, Nairobi

3 Addressing gender in biogas promotion initiatives

The main documentation about addressing gender issues in biogas promotion initiatives in Kenya has been produced by the ABPP. In 2010, Energia produced a manual on gender main-streaming.[50] Subsequently, at a workshop in 2011, an action plan for gender mainstreaming in the ABPP Kenya programme was produced.[51] A study on gender issues in biogas entrepreneur-ship was undertaken in 2013.[52] There is no publication or report on how the gender action plan was implemented, but lessons were shared at the workshop convened as part of this project.[53]

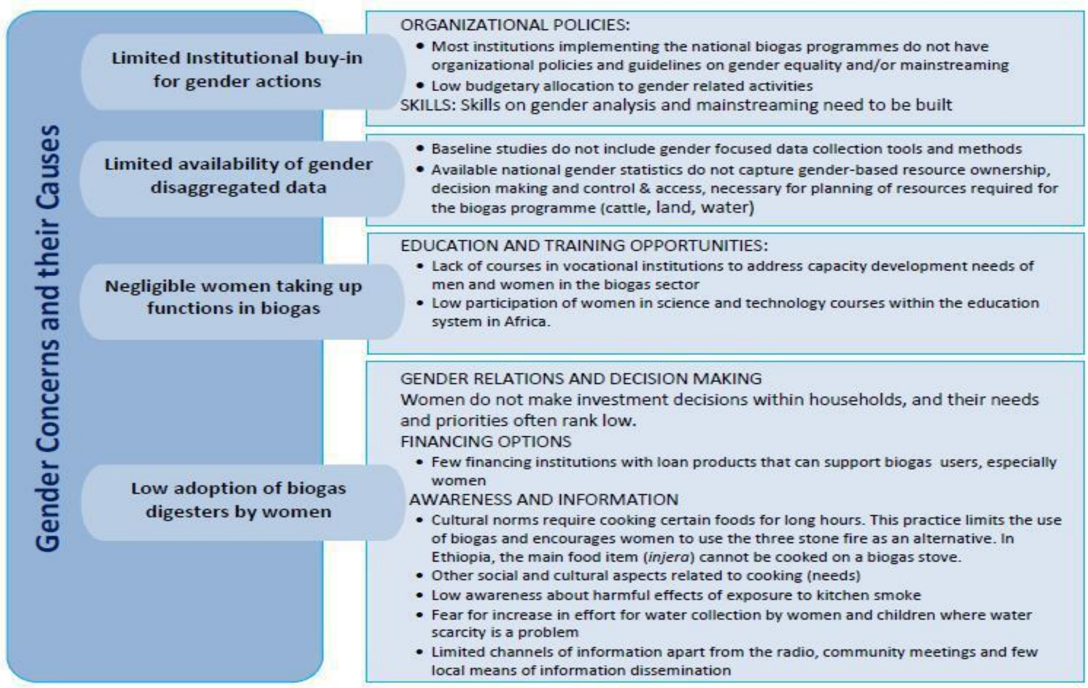

Figure 1 Possible gender issues in biogas promotion planning
Source: Energia (2010)

[50] Energia (2010)

[51] ABPP (2010)

[52] Infowit Research Consultants (2011)

[53] Judith Libaisi, 2016. Mainstreaming gender issues in biogas programmes. Presentation at diary NAMA gender workshop, 5 May 2016

Potential gender issues listed in the gender mainstreaming guide for the ABPP are shown in Figure 1.[54] That document also suggested a range of potential gender-related objectives in bio-gas promotion programmes (table 7), which could be addressed through actions across a range of functions in a biogas promotion programme (table 8).

Table 7 Possible gender goals, outcomes and activities of a biogas programme

Gender goal	Expected Outcome	Examples of activities
Improve quality of life for men and women through biodigesters	• Reduced drudgery for women in fuel collection • Reduced indoor air pollution • Reduced fuel wood consumption	• Encourage diversity of biogas stove designs to make them attractive to women (ease of cleaning & maintenance, variation in number of burners, etc.) • Collect information on what features women look for in cooking technology & do related R&D • Set up service centres and train staff to ensure availability of parts • Ensure that women attend biogas trainings in locations convenient for women
Improve women's livelihoods through biodigesters	• Increased incomes of men and women • Increased number of women entrepreneurs	• Encourage women to become biogas installers and service providers • Provide a safe place for women to stay when installing biodigesters in another village • Encourage women's groups to take up biogas work • Hire women for promotion & sales work •Credit support for women entrepreneurs • Link biogas programme with income generation for users
Promote gender equality and women's empowerment	• Increased education level of girls • Women undertaking self-improvement activities • Improved family health	•Introduce adult literacy programme for women • Provide incentives for parents of girls engaged in fuel wood collection to attend school • Ensure women's representation in biogas programme management and provide the skills needed for this

Source: Energia (2010)

[54]Energia (2010)

Table 8 Gender issues to consider in relation to different programme functions

Programme function	Gender issue to consider
Promotion/sales	• Distinguish between men- and women-users in promotional activities • Emphasize benefits for health, drudgery, time saved, opportunities for education and income generation related to men and women
Training (operation training for users, training for technicians and programme staff)	• Ensure user training targets women and meets their needs • Encourage and train women to become entrepreneurs • Provide incentives for women in the start-up stage • Encourage and train women as extension staff
Extension (post-installation)	• Increase awareness of men and women of the benefits of bio-slurry use for farming and nutrition • Engage women in producing and selling bio-slurry • Increase awareness of men and women on the potential to connect latrine to digester and improve household sanitation
Quality management & sales services	• Ensure that quality control team involves all family members
Credit	• Ensure that men and women can access and control appropriate credit for biogas
R&D standardization	• Involve men and women users in design of digesters and appliances in line with women's needs and priorities
Institutional and partnership development	•Training and consensus building of staff on gender mainstreaming approach • Ensure women users are represented in steering committees etc. • Build capacity of users to perform these roles • Ensure staff receive adequate training for gender mainstreaming • Ensure gender concerns are reflected in key programme documents, ToRs, staff appraisals etc.
Private sector development	• Ensure equal access to business and technical training for men and women • Incentives and support for women entrepreneurs
Finance (e.g. subsidy)	• Ensure subsidy distribution system is non-discriminatory • Disadvantaged clients (e.g. female-headed households) may need additional support
Monitoring & evaluation	• Collect and use gender-disaggregated data • Baseline study and annual user surveys and evaluations must examine gender & socio-economic issues

Source: Adapted from Energia (2010)

The gender action plan for Kenya proposed a number of activities (see appendix 1) and attention to gender issues was reportedly instrumental in reorienting the programme objective in the second phase of ABPP in Kenya to deliver benefits for both men and women.[55] Lessons from programme implementation are summarized in Text Box 2.

Text Box 2: Lessons from the ABPP in gender mainstreaming

Lessons at programme level:

- Policies and guidelines to guide mainstreaming need to be in place
- There must be budgetary allocations to gender
- Limited availability of gender disaggregated data needs to be addressed through baseline surveys
- National and programme level-baselines
- Targeted vocational courses are needed to address the lack of women employed in the biogas sector
- Affirmative action and introduction of flexible working hours can be effective in involving women in biogas service employment

Lessons regarding low adoption at household level:

- Women do not often make the investment decisions, and their needs and priorities rank lower than men’s
- Financing options need to consider investment costs and credit affordability, considering that women have access to smaller volumes of credit
- Awareness and information need to be addressed, especially cultural norms and preferences around cooking, low awareness of the harmful effects of exposure to smoke and access to information on bio-gas

Source: Judith Libaisi, 2016. Mainstreaming gender issues in biogas programmes. Presentation at dairy NAMA gender workshop, May 5th 2016.

The need for upfront investment is widely cited as the main obstacle to biogas promotion in Kenya. Women typically have access to small volumes of credit, e.g. through merry-go-rounds, SACCOs or other micro-credit institutions. They also often lack land title deeds or other forms of collateral. Grameen-bank style group lending models have been identified as one way of over-coming these barriers (see Text Box 3).

[55] Judith Libaisi, 2016. Mainstreaming gender issues in biogas programmes. Presentation at dairy NAMA gender workshop, 5 May 2016

Text Box 3 Group lending to increase women's access to finance

The Visionary Empowerment Programme (VEP),[56] a 7000-member micro-finance organisation based in Thika, began making biogas loans in 2010, and targets farmers and women entrepreneur groups. The number of women applying for loans has increased by an annual average of 13 percent. Of the 1,111 biogas plants it has helped finance, 733 have been for women. Women's groups act as guarantors to a woman getting a loan, and repayment rates average 98.5 percent. Repayments are made in equal monthly instalments over two years, plus 1 percent per month interest on the reducing balance. A number of micro-credit organizations and some banks also offer group-lending products that might be adapted to the needs of biogas projects.

[56] http://vep.co.ke/

4 Gender aspects of related policies

In 2007, Practical Action worked with the Ministry of Energy to produce a "gender audit of energy policies and programmes in Kenya".[57] That study concluded that lack of gender disaggregated data and gender awareness meant that energy policy was not gender sensitive and limited progress had been made in gender mainstreaming in the energy sector. Another review con-ducted in 2015 found that, although gender issues are relevant in the energy sector, and despite some initiatives (e.g. National Policy on Gender and Development, gender-related contents of the 2013 Energy Policy), only "modest progress" had been made in mainstreaming gender in energy policies.[58]

From a climate change perspective, biogas has been listed as a priority in the national Technology Needs Assessment.[59] An assessment of the links between the national climate change action plan and gender and youth issues in Kenya[60] notes the need to:

- Consider gender in the design of adaptation and mitigation strategies and programmes;
- engage women, youth and other vulnerable groups in climate change decision-making and planning;
- create an enterprise fund to support the economic activities of women, youth and other vulnerable groups; and
- collect and strengthen assessment and information gathering on women, youth and climate change.

[57] Mbuthi et al. (2007)

[58] Malonza and Fedha (2015)

[59] Republic of Kenya (2013)

[60] Government of Kenya (n.d.). Mainstreaming Kenya's National Climate Change Action into the Gender, Youth and Vulnerable Groups Sector

5 Summary: Improving opportunities for women to benefit from biogas promotion in the dairy NAMA

Mitigation actions should aim to achieve greater, more effective, sustainable, and equitable cli-mate change results, outcomes and impacts; ensure that women and men have equal opportunity to contribute to, and benefit from supported activities; and mitigate against potential project risks for women and men arising from the supported activities. This final section summarizes constraints and opportunities for these objectives to be met through the biogas component of the dairy NAMA.

5.1 The development case for gender-inclusive development

The development case for biogas to promote gender-inclusive outcomes appears to be clear. Significant benefits are widely reported for reduced labour and health burdens for women adopting biogas. Significant reductions in energy expenditures are also reported, which most likely also translate into benefits for women's ability to deploy cash resources on other household expenditures.

5.2 The business case for addressing gender in biogas promotion initiatives

Although there is a limited basis of good quality documentation on gender issues in biogas promotion and use, there appear to be several good reasons for those involved in biogas promotion to devote resources to understanding and addressing gender issues. Table 9 summarizes some potential justifications for biogas firms to address gender issues.

Table 9 Potential business cases for gender-sensitive biogas promotion

Possible gender issues	Possible actions and benefits for biogas companies
Male control of land and credit for investment and role of men in decision-making may limit ability of interested women to install biogas	Developing financing models not dependent on collateral could increase demand for biogas
Different perception and prioritization of energy issues in the household may lead to low adoption of biogas even where women recognize its benefits	Raising awareness among both men and women of the benefits of biogas adoption could increase demand for biogas
Lack of information on biogas and biogas companies' services may limit adoption	Targeting marketing information to women and men and making access to company's services available to women and men could increase demand for biogas
Men may not have incentives to report and address technical faults	Training in biogas maintenance for women, and making post-sales services easily accessible, especially to women, could reduce post-installation failures and abandonment and protect reputation of biogas companies
Gender roles in bio-slurry utilization are not well understood	Understanding gender roles in bio-slurry use and targeting of information and advisory support could increase the benefits achieved by users and increase demand for biogas
Few women are employed in biogas service companies	Affirmative action in employment, and training for women as sales people or technicians could provide women with employment and increase access to markets

Source: this study

In particular, the high cost of biogas units and lack of finance for upfront investment is widely cited as the most common barrier to biogas adoption. Women typically have access to credit sources that provide smaller volumes of credit, but are excluded from access to formal institutions offering larger sources of credit, mainly due to lack of collateral. Credit delivery models based on group lending have been shown to be one effective way of increasing women's access to credit. Lowering the cost of biogas units and further innovation in finance (e.g. lease-to-own models with regular payments over a longer period) would be relevant to increasing women's ability to invest in biogas.

At the level of a biogas promotion programme, numerous potential entry points have been identified for gender-related interventions (see tables 7 and 8). In general, these entry points may help to:

- Address gender-related constraints to adoption:
  - Ensuring awareness of benefits from biogas adoption to women;
  - Addressing household decision-making processes (and control of assets such as land or capital) that may prevent adoption even when women are inter-ested
  - Targeting of access to information for women and men may need to be im-proved
  - Access to credit and structuring of financial flows can be adjusted to support adoption by men and women
  - The roles that women's groups and female sales staff or extension workers could play in supporting adoption.
- Address gender in the biogas supply chain
  - Women are most likely under-represented in the biogas service sector
  - Training for women
  - Support to women entrepreneurs
  - Ensuring women users have access to ongoing technical support
- Mainstream gender
  - Documentation produced by the ABPP can provide a template for gender mainstreaming
  - Gender disaggregated data is needed, and may be supplemented by in-depth studies and dialogues on gender issues
  - Existing experiences in ABPP and other initiatives with addressing gender can be documented and shared
  - Capacity building for gender analysis and mainstreaming may be needed
  - Leverage existing experience for gender mainstreaming
  - Ensure gender-relevant monitoring

5.3 Gender-related safeguards in biogas promotion initiatives

Any climate finance supported biogas promotion programme would be expected to screen project for social and environmental risks and to develop systems for mitigating these risks. Safe-guards relevant to gender aspects of biogas programmes relate in particular to labour and working conditions and environmental impacts.[61] Safeguards for labour and working conditions refers specifically to requirements that biogas companies must adopt and implement human resources policies and procedures that are consistent with the relevant guidance and national law, put in place an employee grievance mechanism, have procedures to ensure occupational health and safety, and must take measures to avoid child and forced labour. Safeguards for prevention of pollution are relevant to ensuring that biogas slurry does not become an environmental pollutant, such as through providing adequate information, training and post-sales support in bio-slurry use and disposal. Plans should be made to ensure that women receive training in the proper management of biogas units and management of bio-slurry. Where biogas units are in-stalled with support of financial institutions, these institutions may be expected to operate an environmental and social risk management system that ensures the relevant risks are mitigated. In addition, women must be included in consultations on the biogas promotion initiative.

The Green Climate Fund gender policy[62] sets out mandatory requirements for projects. This includes collection of baseline data to:

i. Determine how the project can respond to the needs of women and men;

ii. Identify the drivers of change and the gender dynamics in order to achieve the project mitigation goals;

iii. Identify and design the specific gender elements to be included in the project activities;

iv. Estimate the implementation budgets;

v. Select output, outcome and impact indicators; and

vi. Design project/programme implementation and monitoring institutional arrange-ments.

[61] In terms of IFC's safeguards, this refers to PS2 Labour and Working Conditions, and PS3 Resource Efficiently and Pollution Prevention

[62] GCF (2016)

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Appendix

Appendix 1: ABPP gender action plan for Kenya (2010-2013)

Activity	Responsibility	Timeline
To improve the quality of life of women and men through increased commercial biogas technology adoption		
Development of promotion material Ensure messages target both men and women ,messages communicated through avenues that reach both men and women	Gender Focal Point to coordinate	2010-2013
Demos Women headed households given priority in hosting demos, men and women masons used to construct the demos	District coordinator/Gender focal person	2010-2013
Incentive Incentive for both male and female promoters(Affirmative action)	Promotion and marketing person	2010-2013

Training -Deliberate effort to select women for training -Refresher training for female artisans if necessary -Flexible training hours -Identify more women friendly institutions for training	Training and Extension person	2010-2013
Partnerships development - Deliberate partnership with those organizations with a GM approach - Utilizing Kenfap membership and leadership - Ensure both male and female farmers are targeted, including affirmative action for women	Programming coordinator	2010-2013
Extension Build capacity of female extensionists and male and female farmers	Training and Extension person	2010-2013
After sale service Ensure retention of female masons through refresher courses, peering, safe working environment	Gender focal person/biogas engineer	2010-2013
QC Improved staff capacity on GM and reporting on gender focused activities	Gender focal person/biogas engineer	2010-2013

Financial - Work with organized women groups and women FI - Raise awareness on credit sources **M&E** - Gender and socio-economic baseline, quick scans - Gender disaggregated data in reporting	Gender focal person/PC Gender focal person/PC	2010-2013 2011-2013