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Governance Aspects on Adoption of Biogas Technology in Kiambu County, Kenya

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Abstract

Kiambu is one of the metropolitan and fast-growing counties in Kenya where adoption of clean energy would enhance environmental sustainability. However, governance and utilization of energy like biogas is still hampered by barriers of knowledge, attitudes and practices (KAP), among others. The paper examines the relationship between KAP and governance in adoption of biogas technology in Kiambu. Data was collected from 80 households (n=40 households producing biogas and n=40 households not producing biogas) in four sub counties of Kiambu. Transect line survey of households was done by selecting randomly every fifth household in the study area. There was equal distribution of sampled households for each administrative ward in the sub counties (n=5 for households producing biogas and n=5 for households not producing biogas). Respondents' knowledge, attitudes and practices on adoption of biogas and its governance indicate that 87.64% of the respondents knew about biogas and its usefulness. Only minority (21%) were aware of the regulatory legislation and majority (85%) did not comply with the regulations. Biogas adoption in Kiambu was low (25%) and that majority of those adopting the biogas technology (98%) are not organized into associations. There was also moderate (50%) institutional support for biogas adoption. Results in Table 3 show that willingness to adopt the biogas technology is high in Kiambu (90%), and the felt value addition in being members of biogas user associations is also high (95%). However, the regulation process is weak (21%). It is concluded that there is weak regulation and low adoption of biogas technology in Kiambu. However, a potential exists for enhanced adoption of biogas especially through increased institutional and legislation support. There is also need for awareness creation on governance instruments and need to address the capacity gaps existing.

Key words: *Biogas adoption, governance, knowledge, attitudes and practices, Kiambu County*

Introduction

Environmental governance is the decision-making process in management of the environment and involves a wide spectrum of stakeholders at the local, national and global levels such as governments, non-governmental organization (NGOs), international organizations and civil society (Muigua and Musyimi 2008; NEMA, 2009; IUCN, 2014; Plummer *et al*., 2017). Environmental governance brings excellence in management of the environment by establishing a culture of sustainability that is supported by well thought-out and functional operating systems (Wakiaga, 2018). This is founded on formulation of legal and policy instruments that support decisions with sound outcomes (Olowu, 2007).

Natural resources such as biogas under environmental governance are considered as "global public goods" meant for the well-being of mankind (Thalwitz, 2000; Launay *et al*., 2003; Kok *et al*., 2011). Thus, biogas needs to be protected at all costs for the benefit of current and future generations. Environmental governance advocates for sustainable utilization of such resources (Kotzé, 2006).

The paper focuses on governance of the adoption of biogas in Kiambu County in Kenya in reference to specific regulatory frameworks. Considerations are based on various actors responsible for its regulation as a green energy resource in Kenya. There is a deliberate effort made to understand how governance has influenced the seemingly slow uptake of the adoption despite numerous campaigns for its adoption in Kiambu (Githiomi *et al*., 2012; CIDP, 2013-2017).

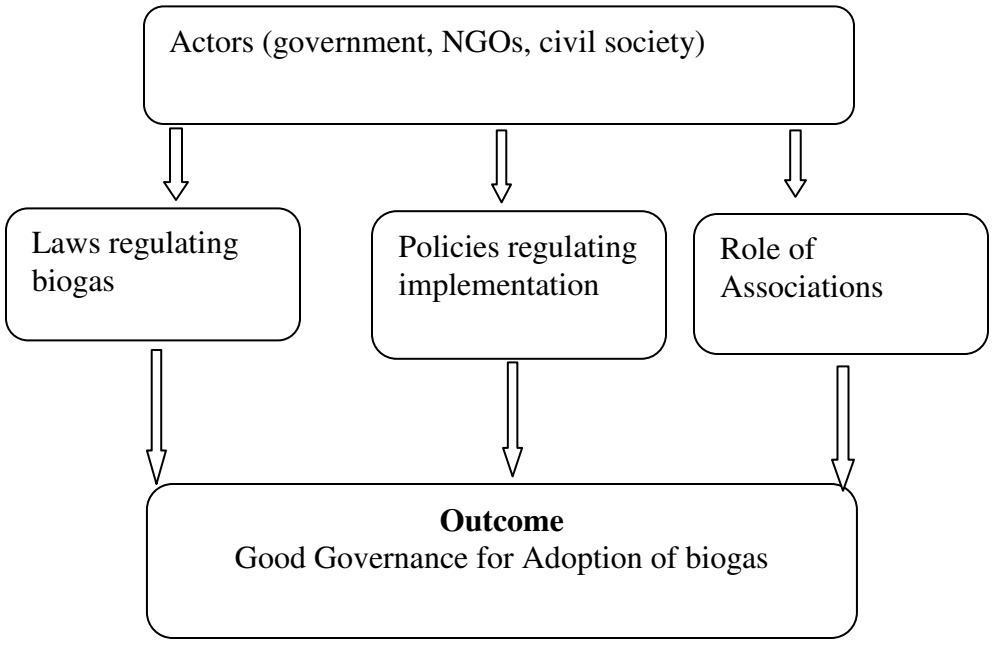

Fig. 1: Conceptual framework

Materials and Methods

The study aimed to understand the governance instruments affecting the adoption of biogas in Kiambu (Fig. 1). The study was conducted in four out of twelve sub counties of Kiambu County, namely Githunguri, Lari, Limuru and Ruiru using a standard questionnaire as previously described (Kivisi *et al*., 2018). Primary and secondary data was used. A sample of 80 households were targeted (n =40 who had adopted biogas and n = 40 who had not adopted). Random sampling was used to select households using the transect line survey of every fifth household for each of the four wards in the four sub counties. The method was preferred because as previously noted it greatly reduces bias and was more efficient (Burnham *et al,* 1985; Pearson and Ruggiero, 2003; Buckland *et al*., 2007).

Quantitative data was analyzed using descriptive statistics such as frequencies, percentages and averages and the significance tested using *Student-T test (P≤0.05),* while *Chi-square test (P≤0.05)* was used to analyze qualitative data.

Results and Discussion

Respondents' knowledge, attitudes and practices on adoption of biogas and its governance (Table 1) indicate 87.64% of the respondents knew about biogas and its usefulness. Only minority (21%) were aware of the regulatory legislation and majority (85%) did not comply with the regulation.

Table 1: Respondents' knowledge, attitudes and practices on biogas and environmental governance (n=80)

Parameter	Yes (positive) (%)	No (negative) (%)
Understanding of biogas	87.64±2.11[a]	12.36±2.17[b]
Awareness of current legislation	21.2±1.62[a]	78.8±1.67[a]
Compliance to laws and policies	84.7±2.05[a]	15.3±2.11[b]

[a,b] *Different letters in the same row differ statistically by Chi-square, P<0.01*

These findings point towards lack of public participation during legislation of biogas and the need to create awareness to promote compliance with laws and policies on biogas governance (Markell, 2004; Muigua and Musyimi, 2008; Murombo, 2008; Plessis, 2008; Wakiaga, 2018). This could be enhanced through the County Governments Act, 2012, which strongly advocates for laws and regulations that allow for unequivocal citizen participation in environmental governance. At the national level lack of awareness could affect the understanding of the connection between adoption of clean energy and a clean, healthy environment, which is advocated for everyone residing in Kenya (EMCA, 1999). The finding on low compliance agrees with others because enforcement and implementation of laws, regulations, policies and regulatory frameworks on clean energy and the environment has been a challenge in many societies (Holley, 2017).

Results in Table 2 indicate that biogas adoption in Kiambu was low (25%) and that majority of those adopting the biogas technology (98%) are not organized into associations. There was also moderate (50%) institutional support for biogas adoption.

Table 2: Institutional support and member association organization supporting adoption of biogas technology in Kiambu (n=40)

Parameter	Yes (positive) (%)	No (negative) (%)
Practicing biogas	24.7±1.44[a]	75.3±1.49[b]
Membership to biogas association	2.35±6.242[a]	97.65±2.785[b]
Institutional support	50.6±1.89[a]	49.4±1.90[b]

[a,b] *Different letters in the same row differ statistically by Chi-square, P<0.01*

These findings are unexpected given that there is value in belonging to biogas users' associations. Advantages of belonging to biogas users' associations have been well documented (BAG, 2017; WBA, 2017). This can be explained by the fact that the low awareness and adoption rate reported in Table 1 contributed to these findings. Thus, as adoption increases, more biogas users' associations will emerge to lobby for support and facilitation in biogas technology. The institutional support cited was some regulation from Kiambu County by-laws and the national government regulations through the Ministry of Energy and Petroleum in liaison with the County Government of Kiambu. However opportunities exist for capacity building.

Results in Table 3 show that willingness to adopt biogas technology was high in Kiambu (90%) and the felt value addition in being members of biogas user associations was also high (95%). However the regulation process was weak (21%).

***Table 3*: Factors for enhancing implementation of regulatory instruments on adoption of biogas in Kiambu (n=80)**

Parameter	agree (positive) (%)	disagree (negative) (%)
Willing to adopt biogas	89.7±2.43[a]	10.3±2.38[b]
Value addition in associations	95.29±1.29[a]	4.71±1.48[b]
Regulation of biogas is strong	21.18±1.74[a]	78.82±1.97[b]

[a,b] *Different letters in the same row differ statistically by Chi-square, P<0.01*

These findings are unique to Kiambu County. The county has been documented to have good laws meant to protect the environment but not implemented (CIDP, 2013-2017). Probably there is a disjoint in the legislation leading to lack of stakeholder involvement and participation as spelt out in the EMCA Act of 1999 (Mireri and Letema, 2012). What gives hope is the residents' willingness to adopt the technology as a source of clean energy, which automatically would enhance regulation in sustainable social-economic progress (Bolinger *et al*., 2001). More critically, these frameworks would be enforced for the desired invaluable benefits to man and the environment and the county and national governments (Augusto and Ioris, 2014).

Conclusion and Recommendations

There is weak regulation and low adoption of biogas technology in Kiambu. However potential exists for enhanced adoption of biogas especially through increased institutional and legislation support. There is also need for awareness creation on governance instruments and the need to address the capacity gaps existing.

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