HOUSEHOLD AWARENESS AND KNOWLEDGE ON IMPROVED COOKSTOVES : A CASE OF KILIMANJARO REGION, TANZANIA

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Abstract

The initiatives to replace inefficient cooking stoves with improved cookstoves (ICS) in developing countries have not been successful. The available studies have given less attention to consumer's awareness and knowledge on ICS despite the two variables being essential on the adoption decision. This study was conducted in Kilimanjaro Region, Tanzania covering 294 households to explore household awareness and knowledge on ICS and establish if awareness and knowledge differ between adopters and non adopters. The findings revealed that there were limited awareness and knowledge on the use ICS and negative opinion on efficient cooking behaviour. The Mann Whitney U test showed a significant difference ($p \leq 0.001$) between adopters and non adopters on efficient cooking behaviour. On the other hand, there were no significant differences ($p \geq 0.005$) between adopters and non adopters on knowledge and skills of ICS use. The study concludes that the low level of awareness and knowledge on efficient cooking behaviour and on skills in respect of application of ICS might slow down the process of making decision to adopt ICS. Additionally, low knowledge may lead to non adherence to the technical use of ICS hence failing to maximize the recommended ICS efficiency which subsequently affects the perception on ICS.

Keywords: adoption, awareness, knowledge, ICS, efficient cooking behaviour, traditional biomass

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3.2 Introduction

Access to clean cooking energy has been a challenge for developing countries where majority are depending on traditional biomass for cooking and heating. Following the world energy crises and the poverty level of people who are living in developing countries the trend is expected to continue for some years to come (Maes and Verbist, 2012). This creates a concern due to various social, economic, environmental, and health problems associated with the use of biomass in its traditional form. It has been acknowledged that high dependence on biomass has increased its scarcity and hence led to more burden to women and kids who are responsible for fetching fuel wood for the families (Vaccari *et al*., 2012). In addition, dependence on traditional biomass as major sources of cooking energy in developing countries is coupled with the use of inefficient traditional open fire stoves, which, apart from having low energy efficiency, are the source of indoor air pollution with serious health effects (Saatkamp, *et al*., 2000). The traditional biomass fuel and inefficient cooking stoves are associated with indoor air pollution which increases the incidences of respiratory infections and other health risks (Fullerton *et al*., 2008; Karekezi and Kithyoma, 2003).

The energy situation in Tanzania is following the international trend where regardless of availability of various energy resources biomass in a traditional form (firewood, charcoal, agricultural residues and animal wastes) are the main source of energy in which accounts for more than 96% of the total household (Global Alliance for Clean Cookstoves, 2014). Burning of traditional biomass in inefficient wood energy conversion technologies in this case traditional open fire stove, have been identified as the causes of deforestation and poor indoor air quality in Tanzania (Lusambo, 2009; Lyimo, 2005/06). The effects are evident whereby around 45 871 783 people are reported to be affected by household air pollution (HAP) in Tanzania (Global Alliance for Clean Cookstoves, 2014). This implies that failure to address the problem the welfare of the majority of people in Tanzania will continue to be at risk.

Several policy options have been proposed; the first option is to climb the energy ladder by switching from solid fuels to fossil fuels and the second option is to increase the sustainability of the traditional biomass system (Maes and Verbist, 2012)

The second policy option becomes feasible for developing countries. In addition, Improved Cookstoves (ICS) becomes critical means of achieving fuel efficiency and sustainability of biomass utilization (Puzzolo *et al*., 2011). The ICS is among the fuel efficiency interventions that allow the same amount of energy to be produced with less fuel and emission (Larson and Rosen, 2002). The use of biomass energy sustainably and more efficiently revives its renewability (World Bank, 2011). The improved cookstoves have been appreciated for their triple dividends, where the stoves contribute to local environmental quality, global climate benefits, while addressing welfare objectives since the stoves can reduce fuel consumption and at the same time reducing the health and social drudgery associated with biomass use (Lewis and Pattanayak, 2012; Rouse, 1999). Despite the apparent benefits of ICS and the continued scarcity of fuelwood the adoption rate for ICS is not promising. In sub-Saharan Africa only 6% of people who rely on solid biomass fuels use improved cooking stoves, compared to 27% of people in developing countries as a whole (Legros *et al*., 2009). The study by Lusambo (2009) reported that only 25% of the households in Morogoro and Ruvuma Regions were using ICS. The overall use of ICS in Tanzania is standing at 1% (Global Alliance for Clean Cookstoves, 2014). The question is why the adoption rate is not promising.

Despite the existing of various studies determine the reasons for low uptake of clean cooking fuels and technologies but the studies are directed towards Asia (particularly India) and few scattered studies in Latin America and Africa (Lewis and Pattanayak, 2012). Furthermore, the studies are focusing on variables like demographic characteristics like age, household size, religious affiliation and number of under five years of age children and household socio economic characteristics and fuel related factors (income, education, fuel price of the fuel, price of the stove, occupation etc (Adrianzen, 2011; Gebreegziabher, 2007; Jan, *et a*l., 2012; Jan, 2011; Muneer and Mohamed, 2003; Pine *et al*., 2011; Silk *et al*., 2012; Brouwer, and van Beukering, 2013). The existing studies have given little attention to the understanding of the level of household awareness and knowledge on the promoted stoves. Therefore, this study was proposed to fill in the existing gap by assessing the household awareness and knowledge on ICS and how the variables are associated with ICS adoption.

It was important to explore awareness because the variable is part of knowledge for the reason that being aware of the existence of innovation motivates an individual to move a step ahead to learn more about the merits of the innovation and also exploring the basic principles of the innovation application. Knowledge on principles and how to use any innovation becomes an essential variable on the innovation adoption decision process (Rogers, 2003; Sahin, 2006) hence its understanding becomes important to inform energy practitioners on how well the ICS are known by prospective consumers. On the other hand understanding of the household knowledge on ICS will help project implementers to realize the conflicting level of knowledge between consumers and stove promoters. This implies that failure for the household or potential adopters to have the right knowledge on ICS might have two major implications; (1) might slow the process of adoption decision while on the other hand the adopters with limited or low knowledge will fail to adhere to the technical recommended practices and use of ICS hence increases chances of ICS failing to achieve its efficiency. Failure of the stove to achieve its efficiency will damage the ICS image within the community hence leads to negative perception toward it.

As argued by Mallett (2007) that the decision-making process begins when an actor first becomes aware of an innovation. The awareness builds a role of strengthening the knowledge base of an individual towards an innovation. Knowledge is one of psychological constructs referred to as intervening variable which is considered direct determinants of behavioural change (Düvel, 1991, 1997). Being a psychological construct is regarded as; mediating or transmitting the effects of other variables to the behavioural outcome, and having effects on behaviour outcome (Annor-Frempong and Düvel, 2009). Knowledge as an intervening variable is categorized into basic knowledge or knowledge of principles, knowledge or awareness of the solution (innovation), knowledge on relative advantages, knowledge or skills in respect of application of innovation (Duvel, 2007). In this study the knowledge on recommended solution, knowledge on relative advantages and the knowledge or skills with respect to application or use of ICS were covered.

The study therefore answers the following general research question; how did adopters and non adopters differ in terms of the level of knowledge on ICS. Specifically, the study answers the

following research questions. What was the level of awareness on ICS in the study area? Awareness is enhanced by the sources of information about innovation hence the study answers the question on what were the sources of information about ICS in the study area. Furthermore, the study explores if people knew about the benefits of ICS (knowledge about relative advantages of the stove). Lastly the study determined if the knowledge differed between adopters and non adopters by testing the following two hypotheses;

H1 = The knowledge scores on efficient cooking practices are the same for adopters and non adopters

H2 = The knowledge scores in respect to the application skills on use of ICS are the same between adopters and non adopters.

3.4 Methodology

The study was conducted in Kilimanjaro Region, Tanzania. The regions were selected for reason that it is among fuel wood deficits in the country (Mwihava, 2002) and there are initiatives to promote and disseminate improved cooking stoves. The study applied a cross- sectional research design where data were collected only once. A total of six villages were selected, three from Rombo District and other three from Hai District, in Kilimanjaro Region. The unit of analysis was the household because the decision making on which type of cooking fuels and appliances to be used is made at household level. Simple random sampling technique was used to select 294 households to be included in the study.

The study triangulates sources of information by applying both quantitative and qualitative approaches for data collection. A questionnaire contained a five point likert scale where the respondents were asked a set of questions and requested to indicate their level of agreement; 1= strongly disagree and 5= strongly agree. This was both for the (1) knowledge on efficient cooking behaviour and (2) knowledge or skills with respect to application of ICS. To capture awareness on ICS structured questions with "Yes" and "No" responses were used while knowledge on advantages of ICS was captured through structured questions with multiple responses. Qualitative data were collected through Focus Group Discussions (FGDs) and key informant interviews in each village whereby a checklist of questions was used to guide the discussions. Apart from FGD serving a purpose of information triangulation the approach was

useful in getting insights on some issues which could not be captured through a structured questionnaire survey. In addition key informant interviews were conducted to capture some information which needed an in-depth understanding. Key informants were selected based on their knowledge of the themes need to be understood like exploring the socio cultural role of traditional stove in communities.

The study employed both quantitative and qualitative data analysis approaches. The objective was to assess the awareness and knowledge levels among the study communities and whether the element differs between the two groups. Descriptive statistics were performed where frequencies and percentages were used to present results on awareness, sources of ICS information, benefits of ICS, knowledge on efficient cooking behaviour and knowledge on ICS. Furthermore to be able to categorize respondents into different knowledge levels mean index scores for knowledge with respect to application and use of ICS and on efficient cooking behaviour were computed. Then based on mean index, respondents were grouped into "Not knowledgeable" "neutral" and "knowledgeable" while for the efficient cooking behaviour/practice, two categories were used "positive" and "negative" opinion implying knowledgeable and not knowledgeable on efficient cooking behaviour/practice respectively.

To be able to test if the knowledge scores on efficient cooking behaviour and practices were the same for adopters and non adopters Mann Whitney U test was used where the test compared the knowledge scores on efficient cooking behaviour between adopters and non adopters. The same non parametric analysis model was used to test if the scores on knowledge in respect of application of ICS were the same between adopters and non adopters. The test allows for comparison of the median of the two groups and converts the scores to ranks and tells whether there is a significant difference between the groups (Pallant, 2007). In both test r value was calculated to establish an effect size where the criteria used was 0.1 small effects, 0.3 medium effects and 0.5 large effects (Cohen, 1988). The qualitative information from FGDs were analysed by organizing responses from the discussion into themes. Then interpretation was made by researcher and subsequently used in the discussion. The results were mostly used to back up the quantitative analysis.

Results and Discussion

Awareness about improved cookstoves

This study identified household awareness on ICS based on four questions; ever heard about the ICS, ever seen any type of ICS, ever attended any awareness campaign and if aware of any organisation dealing with renewable energy technologies. The results in Table 1 revealed that majority of the respondents had information about ICS given that 93.2% and 82% of all respondents reported to have heard and seen the ICS, respectively. Regardless of the high level of awareness on two aspects, it was found that 82% of all respondents had never attended any awareness campaign. This was also accompanied by low awareness on the existence of Renewable Energy Technologies (RET) dealers/ promoters. The results in Table 1 reveal that 64.3% of respondents were not aware of existence of any organisation dealing with RETs. The two aspects are more important in delivering the right message about stoves.

Table 1: Respondents awareness on improved cookstove (n = 294)

Statements	Yes		No	
	Frequency	%	Frequency	%
Ever heard about ICS	274	93.2	20	6.8
Ever seen any type of ICS	242	82.3	52	17.7
Ever attended any awareness campaign	53	18	241	82
Awareness of any RET dealer	105	35.7	189	64.3

The overall results in Table 2 show that there was limited awareness of ICS. This was attributed by the sources of information about the stove. The major sources of information about ICS were found to be from the colleagues within the village (44.2%), users of ICS (34.8%) and awareness campaign (14.6%). The sources of communication matters a lot on the type of message delivered. Although Miller and Mobarak (2011) argued persuasion campaigns are likely to have short-lived effects, further argued that the campaign becomes important when the technology benefits are obfuscated. In this case the campaign from the organization dealing with the ICS design, promotion and selling becomes important in delivering the right message about the

benefits of the stoves to the customers. The risk behind receiving information from the colleagues within the village is that once the technology has failed to meet the needs of the few individual adopters the probability of sharing the bias based on weakness will be high.

In the assessment of consumers' perception on ICS it was found that ICS was perceived to be of low prominence than the traditional stove. This was found to be due to the number of technical problems identified by users and non users towards ICS. This implies that the communication through colleagues will continue to publicize the negative perception towards the stove. It was found from the key informant from Shimbikati Village in Rombo district when asked about what do adopters says about ICS;

> *"Adopters of ICS with chimney are regretting for wasting their money to install the ICS. The stoves are not functioning well..... have several technical problems. Most of them have abandoned the stoves because they were no longer working '... majorly do not advices others to install* (Male FGD participant- Shimbikati Village)

The above quotation presents kind of message the adopters shares with their colleagues within the village hence making non adopters not regretting for not adopting.

Table 2: Source of information about ICS (n = 294)

Sources of information	Frequency	Percentages of responses
Within the village	160	44.2
Users of ICS	94	26.0
Awareness campaign by organization dealing with RETs	53	14.6
Local environment organization	25	6.9
Church	17	4.7
Mosque	4	1.1
Radio	5	1.4
In other regions (outside Kilimanjaro)	4	1.1
Total	362	100

Knowledge on benefits of the stove (n = 294)

One of the elements influencing the individual or any unit to adopt an innovation is relative advantages of the innovation in comparison to the one expected to be replaced. The results in Table 3 show that 54.6% of respondents identified reduction of fuelwood as the main advantage of ICS. Other respondents (15.7%) reported reduction of indoor air pollution and less stress during cooking (7.5%) to be advantages. The ICS have multiple benefits like Regardless of ICS have several other merits, the results implied limited knowledge and awareness on ICS benefits. It was also reported by Hasalkar *et al*, (2012) that 50% of the respondents reported not to be aware of the benefits and problems of ICS. Although studies have found some quantifiable benefits like job and income generation due to time saved from cooking and fuel expenditure, health benefits, local and global environmental benefits to be associated with the ICS use García-Frapolli *et al*. (2010), it was found that the benefits were not known by respondents.

Table 3: Perceived benefits of the improved cookstove (n = 294)

Benefits	Frequency	Percentage of responses
Reduced fuel consumption and cost	234	54.8
Reduced indoor air pollution the house roof remain clean	67	15.7
Cooking becomes easer - no stress during cooking	32	7.5
Reduced health problems associated with the use of firewood	14	3.3
Can cook more than one type of food at a time	9	2.1
Enjoying tasty food without smoky aroma	3	.7
Iron sheet more durable	3	.7

No benefits at all -not durable	11	2.6
Don't know	54	12.6
Total	**427**	**100**

Knowledge on efficient cooking practices

Knowledge about stoves can be associated with the individual understanding about efficient cooking behaviour and practice. If the person believes in efficient cooking practice the possibility to adopt efficient cooking devices is expected to be high. The results in Table 4 show that among seven statements connoting efficient cooking behaviour only three statements were positively agreed to be practiced by the respondents. The statements were close monitoring of fire during cooking accounted for 86.6% of the respondents who agreed that the practice reduce fuel consumption. On the other hand covering food during cooking and preparing all ingredients before cooking was agreed by 94.6% and 91.8% respectively.

Table 4: Knowledge on efficient cooking behaviour and practice (n = 294)

Behaviour/Practice	**Frequency**	**Percentage of responses**
Using more fuel to cook faster		
Agree	222	75.5
Neutral	5	1.7
Disagree	67	22.8
Total	294	100.0
Using efficient cooking devices		
Agree	40	13.6
Neutral	100	34.0
Disagree	154	52.4
Covering food while cooking		
Disagree	7	2.4
Neutral	9	3.1
Agree	278	94.5

Monitoring of fire during cooking		
Disagree	19	6.5
Neutral	20	6.8
Agree	255	86.7
Preparing all cooking ingredients and tools before setting fire and cooking commence		
Disagree	13	4.4
Neutral	11	3.8
Agree	270	91.8
Put few pieces of firewood in all sides or fuelling few sides of the traditional stove reduces fuel consumption		
Disagree	252	85.7
Neutral	19	6.5
Agree	23	7.8
Soaking food which requires longer cooking time consumption		
Disagree	252	85.8
Neutral	21	7.1
Agree	21	7.1
Mean index	**23.7**	
Overall knowledge		
Negative (not knowledgeable)	185	62.9
Positive (knowledgeable)	109	37.1

The results further show that knowledge on some practices intended to reduce fuel use was low. For example, 75.5% respondents agreed that using more fuel during cooking fasten the process of cooking. This implies that the respondents believe in using more fuels (i.e. more pieces of firewood) to speed up the cooking process. This was also supported by the practice of putting fire on both sides of the traditional stove where 87.5% of the respondents disagreed that putting fire on one or two sides of the traditional stove will not reduce the fuel consumption. This entail

that when a cook prepares food the stove is fuelled in all three sides in order to reduce cooking time. This was also supported by women participants of FGD from Inshara Village when asked what they considered to be the best practice in fuelling the traditional stove.

> *"For us women we like to see both sides full of firewood and the fire sparking over the pot. Sometimes we understand that we are losing a lot of energy ..... that is not our primary concern, the issue is to shorten the cooking time*..... (Female FGD participants-Inshara Village)"

Furthermore, the results in Table 4 show that 85.7% of the respondents disagreed with statement that soaking food like beans which requires longer cooking time will reduce time and fuelwood consumption. This was found not to be a practice to most families. This was due to low knowledge on using efficient devices like pressure cooker. As shown in Table 4, the statement on use of efficient cooking device like pressure cooker to reduce fuelwood and cooking time was disagreed by 52.4% while 34.8% of the respondents were neutral. It was observed that the devices were not much known and for the few who reported to be aware during the focus group discussions complained that the food cooked using pressure cooker does not preserve its natural flavour. Moreover, the device was reported to be known and used by women of middles ages than old women. However, in other studies households of older people were reported to have more energy efficient behaviour than young ones (Carlsson-Kanyama, *et al*., 2005). It can be argued that the demonstrated energy behaviour by old people was more related to what Abrahamse (2007); Rutherford *et al*. 2007) refers to curtailment behaviour. For example removing stain in the clothes and airing clothes than washing it rather than adoption of efficient technologies like pressure cooker. Adoption of energy efficient technologies curtailment behaviour involves changing of energy related behaviours. The low awareness and knowledge on efficient cooking devices like pressure cooker was also reported by Hasalkar *et al*. (2012) where argued that less than fifty percent of the respondents reported not to be aware of the devices.

Even though the overall result from descriptive analysis show majority had no knowledge on efficient cooking behaviour / practice, comparison between adopters and non adopters revealed slight differences. As presented in Table 5 the Mann Whitney U test revealed significant

difference in knowledge on efficient cooking behaviour of adopters (md = 25, n =77, mean rank = 171.89) and non adopters (md= 24, n= 217, mean rank 138.85) (U = 6476.5, z = -2.948, p= 0.003, r = 0.17). The r value indicates the strength of the difference between the two groups to be weak. This led to the rejection of null hypothesis that the two groups have the same level of knowledge. The weak r value is supported by the descriptive results in Table 4 where majority of the respondents were categorized into negative opinion or not being knowledgeable about efficient cooking behaviour. This implies that regardless of the slight significant difference between the two groups, the groups have more less the same level of knowledge concerning efficient cooking behaviour. The low knowledge on efficient cooking practices and behaviour for adopters of ICS were likely leading to failure to comply with proper utilization of the ICS to yield its maximum benefits. Failure for ICS to yield its maximum expected efficiency due to malpractices might lead to negative perception on the ICS.

Table 5: Mann Whitney U test results on efficient cooking behaviour between adopters and non adopters

	Statistics	Grouping variable	
		Adopters	Non adopters
Mann Whitney U	6476.5		
Z value	-2.948		
P-value	0.003		
r-value	0.17		
Median		25	24

Knowledge on practical aspect of the stoves

The improved cookstove exists in various designs where some models are relative technically simple and some are more advance. It was found that three distinct designs were available in the study area, which were portable imported improved stove, improved stove without chimney locally made and improved stove with chimney fixed in the kitchen. Regardless of the existence of various prototypes of ICS in the study area the results in Table 6 show that only 30.6% of the

respondents agreed to know that ICS are of different designs. This implies limited knowledge on various models of ICS.

On the other hand, the same results show that knowledge on ICS efficiency was also low since 56.1% of the respondents agreed that the stove is less efficient than traditional stove. Technically, ICS of any design are relatively more efficient in terms of fuel consumption and cooking time. Although it has been observed from other studies that the ICS efficiency demonstrated in the laboratory settings does not match with the actual efficiency in real world of the users (Hanna *et al*; 2012). The efficiency is much affected by the household cooking behaviour and practices. Given the low knowledge on efficient cooking behaviour the users of ICS fail to adhere to the recommended use due to the interest of maintaining their traditional cooking practices. In most cases the ICS fails to deliver its maximum efficiency hence lead to negative perception that ICS are less advantageous than traditional stove.

The study found limited knowledge on the flexibility of ICS with chimney where the technician can adjust and allow users to change the ring to support relative bigger or small cooking pot. The result from Table 6 shows that 60.9% of the respondents disagree with the statement that there is possibility for technicians to adjust cooking pot holder during stove construction. It was interesting to find even adopters had that limited knowledge on this aspect. In the assessment of consumers' perception on ICS it was revealed that one among the identified technical limitations of the ICS was reported to be fixed cooking pot holder where the households considered ICS to be less flexible.

Table 6. Household Knowledge on practical aspects of ICS (n = 294)

Statement	Non Adopters		Adopters	
	Frequency	%	Frequency	%
ICS are of different designs				
Disagree	106	36.1	25	8.5
Neutral	68	23.1	5	1.7
Agree	43	14.6	73	16
ICS installation skills are easy to be acquired				
Agree	60	20.4	42	14.3
Neutral	123	41.8	5	1.7
Disagree	34	11.6	18	6.1
No after sell/installation services and maintenance				
Required for ICS				
Agree	52	17.7	28	9.5
Neutral	106	36.1	33	11.2
Disagree	59	20.1	16	5.4
ICS does not require special skills to use				
Disagree	38	12.9	54	18.4
Neutral	137	46.6	7	2.4
Agree	42	14.3	16	5.4
ICS is less efficient than traditional stove				
Disagree	23	7.8	21	7.1
Neutral	77	26.2	8	2.7
Agree	117	2.7	48	16.3
ICS are relative expensive than traditional stove				
Disagree	83	28.2	29	9.9
Neutral	110	37.4	41	13.9
Agree	24	8.2	7	2.4

Regardless of some differences in some statement between adopters and non adopters on knowledge on practical aspect of ICS the differences between the two groups was not statistically significant. As shown on Table 7, Mann Whitney U test revealed no significant differences in the knowledge scores of adopters (md =22, n =77) and non adopters (md = 23, n = 217), U = 7434, z = -1.447, p = 0.148, r = 0.08. This led to the acceptance of null hypothesis that the two groups have no differences in knowledge level.. Through the descriptive analysis in Table 5 majority were grouped under category of not being knowledgeable hence can be concluded from Mann Whitney U test results that both adopters and non adopters had limited knowledge on practical aspects of ICS use. It was argued that improved knowledge on ICS is an important factor for ICS adoption (Muneer and Mohamed, 2003). The low knowledge levels between the two aspects (efficient cooking practices and ICS use) have two possible implications. First, for adopters having low knowledge on efficient cooking behaviour might lead to failure to priories ICS as a solution to the fuel wood scarcity. On the adopters, combining their low knowledge on efficient cooking practices together with low knowledge on ICS use might affect the ICS performance. This will be realised due to the malpractices based on the inefficiency behaviour and practices which will consequently affect the expected ICS efficiency. This implies that the low level of knowledge on technical aspects of the ICS is threat to the process of ICS adoption.

Table 7: Mann Whitney U test results between adopters and non adopters on knowledge

	Statistics	Grouping variable	
		Adopters	Non adopters
Mann Whitney U	6476.5		
Z value	-1.447		
P -value	0.148		
r- value	0.08		
Median		22	23

Conclusion and Recommendations

This paper has shown a level of awareness and knowledge on ICS and how the knowledge score differs between adopters and non adopters. The major source of awareness was found to be from

the colleagues and friends or users of the stove within the village. The study conclude that this source of information create a high risk of publicizing the weakness of the stove than its strength. The awareness and knowledge on benefits of ICS was found to be limited to one aspect of reducing fuel consumption while limited knowledge was noted on other attributes of the stoves. The benefits were more reported by adopters than their counterpart. The implication of this result is that the non adopters are not well informed about the merits of the stoves. It was found that knowledge on efficient cooking behaviour was very low since majority of the respondents were not knowledgeable on some efficient cooking practices which could facilitate them to adopt efficient cooking devices. There were weak significant differences between adopters and non adopters on efficient cooking behaviour and practices. This was attributed by the fact that respondents had limited knowledge related to efficient cooking practices. The knowledge or skills in respect of application of ICS between adopters and non adopters were not significant difference implying more less the same level of knowledge between the two groups.

Due to limited knowledge on the ICS there is a need for more awareness creation from the organisation dealing with promotion of renewable energy technologies to facilitate understanding of the benefits of ICS hence increases the adoption of ICS. The campaigns should focus more on the need to improve household energy efficiency behaviour by creating more awareness on problem related to over utilization of fuelwood resource. This will create self conscious and efficiency behaviour hence creates more opportunity for households looking for a more efficient technologies. The low level of knowledge and awareness on ICS might affect the perception on ICS hence the study propose for further study to assess consumers perception on ICS.

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