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Research Article

Knowledge, Attitude and Practices of Horticultural Processing Micro, Small and Medium Enterprises on Energy and Water Use in Kenya

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ABSTRACT

Horticultural processing involves intensive consumption of water and energy. It's unknown whether the current energy and water use practices by micro, small, and medium enterprises (MSMEs) are sustainable. This study was conducted to investigate knowledge, attitude, and practices on energy and water use by horticultural processing MSMEs in Kenya. A cross sectional research design was adopted and purposive sampling was used to select 39 horticultural processing MSMEs. Data were collected using a structured questionnaire. The study found that the MSMEs had excellent knowledge on energy and water use efficiency. The study further found out that 75% of the respondents had a positive attitude towards the environment. Over 80% of the respondents had adopted simple housekeeping practices geared at conserving energy and water. Multiple linear regression indicates age has an effect on knowledge, attitude, and practices (R^2=0.272; F=4.238; P=0.012). The other variables had a non-significant effect on knowledge, attitude, and practices. Despite the high level of knowledge possessed by the MSMEs, they still have not adopted long term practices that will lead to sustainability in the long run. In addition, the findings from this study reveal that MSMEs are not sufficiently motivated to move from positive attitude towards energy and water use practices. Subsidies and rewards could help MSMEs adopt practices that will lead to sustainability in this industry in the long run.

Keywords: KAP, energy use and water use efficiency, horticultural processing, MSMEs, sustainability

INTRODUCTION

The food processing industry is amongst the prime consumers of water and energy in the manufacturing sector (Compton et al., 2018; Nikmaram and Rosentrater, 2019; Walker et al., 2018). This industry is characterized by intensive consumption of water due to the various types of processes and unit operations, which involves usage of water such as cleaning, cooling, pasteurizing among others. Moreover, good quantity and quality of water is crucial for food processing (Sánchez et al., 2011). The major environmental issue to be resolved is the high rate of consumption of potable water. Adoption of a systematic method towards management of water could lead to 30%-50% reduction in the total amount of water used in this sector (Olmez, 2013).

In Europe the agro food industry constitutes the major manufacturing industry and it accounts for 14% of the overall turnover which amounts to over 836,000 million euros. This industry is made up of over 30,000 companies within the European Union (EU) with the majority being small and medium enterprises (SMEs) with less than 250 workers. These SMEs are a source of employment to about 2.7 million persons and constitute 48.5% of the overall production of the agro food industry in the EU. In Spain, the agro food industry is the lead industry in the industrial sector (Sánchez et al., 2011). In low and middle income countries, the food processing and beverages is regarded as the most important subsector in the agro industry and it accounts for over 50% of the total formal agro processing sector (Woldemichael et al., 2017).

Demand for water globally is expected to exceed supply by over 40% by 2030 and by more than 50% in the developing countries especially in sub Saharan Africa (Chellaney, 2013). A country is classified as water stressed if the per capita water availability is less than 1,700 m^3 yearly. Kenya is amongst the countries regarded as severely water scarce globally with per capita availability below 1,000 m^3 per annum (Jones, 2014). The continual growth of the population in Kenya's urban areas as well as the continued rapid urbanization of the rural areas

has led to increased demand for water for industrial, domestic, as well as agricultural uses (Kibuika and Wanyoike, 2014).

In Kenya, electricity and petroleum are the major drivers of the economy whereas biomass is mostly consumed in the rural areas and a small section of the urban population. Nationally, wood fuel as well as other biomass account for close to 68% of the total primary energy consumption, followed by petroleum at 22%, electricity at 9%, and other fuel sources as well as coal at 1%. Solar energy is mainly utilized for drying, heating and lighting (Government of Kenya, 2021).

The food industry globally utilizes approximately 200 exajoules annually (EIA, 2017; FAO, 2017). The various unit operations through which fruits and vegetables pass in order to obtain the final processed product require input of energy. This industry needs energy for heating, cooling, and lighting (FAO, 2011). Drying is an energy intensive process, heating and pasteurization operations require production of steam, large amount of electrical energy is needed for operation of electric motors as well as air compressors; boilers, sterilizers, and heat exchangers operate at high temperatures whereas freezing and cooling operations demand extremely low temperatures (Patel et al., 2019). To perform these unit operations large amounts of electricity are needed and this translates to high operating costs for the MSMEs.

The energy use by MSMEs is not well understood, documentation on why, how much and where energy is used is inadequate (Hampton and Fawcett, 2017). The major problem facing the fresh cut industry is the inadequate data on the amount of water consumed at the particular phases of the processing line (Olmez, 2013). In order for any shift towards sustainability be successful, it is imperative to comprehend the knowledge, attitude and practices (KAP) associated with sustainability in various populaces. The KAP model associates cognitive, affective, and behavioural elements that are subject to interventions from communicative actions that intensify the level of knowledge, changes attitudes as well as improves practices (Salas-Zapata et al., 2018).

Generally, knowledge is deemed as an essential pre-requirement of someone's behaviour (Gifford and Sussman, 2012). Attitude refers to the evaluation of an object, concept or behaviour along a dimension of favour or disfavour, good or bad, like or dislike (Ajzen and Fishbein, 2000). Environmental attitude refers to caring about environmental issues or the concern for the environment and is also referred to as pro-environmental behaviour (Gifford and Sussman, 2012). Practices refers to particular activities that are directly associated with processes that are cognitive (knowledge) and affective (attitudes) to the extent that all human acts are consistent with their, beliefs, values, culture, understanding, and other socialization processes (Heimlich and Ardoin, 2008).

Sáez-Martínez et al. (2016) studied factors encouraging environmental responsibility in European SMEs. The focus of Hoogendoorn et al. (2015) was what drives environmental practices of SMEs. Attitude and awareness towards environmental management and its impact on environmental management practices have been studied (Cassells and Lewis, 2011; Weerasiri and Zhengang, 2012); however, the authors did not consider knowledge. Studies have been carried out on employees' pro-environmental behaviour in SMEs (Banwo and Du, 2019; Fatoki, 2019); the focus of these two studies was an employee perspective. Environmental sustainability practices of SMEs have been conducted (Domínguez-A. et al., 2015; Yusliza et al., 2020). Ouma et al. (2021) studied knowledge, attitude and practices of MSMEs but their focus was on waste management. KAP study of energy conservation at workplace among employees has been carried out though of University employees (Seniwoliba and Yakubu, 2015) and not MSMEs. The current study is unique that to the author's knowledge, there is no study that has so far been done on knowledge, attitude and practices of horticultural processing MSMEs on energy and water use efficiency in Kenya. The study thus lays a foundation for other similar studies in Kenya and the rest of Africa.

MATERIALS AND METHODS

Study Area

The study was conducted in Kenya in Nairobi, Kiambu, Nyeri, Makueni, Laikipia, Nakuru, Murang'a, Embu, Meru, Kisumu, Homabay, Uasin Gishu, and Vihiga counties and the study targeted horticultural processing MSMEs. Horticultural processing MSMEs refers to the MSMEs involved in the postharvest activities related to fruits, vegetables, medicinal, aromatic and ornamental plants including preservation, transformation and preparation of agricultural production for intermediary or final consumption. The study areas are shown in **Figure 1**. The study areas have been marked on the map.

Research Design

This study employed a cross sectional research design that enabled the researcher to collect data on knowledge, attitude, and practices on energy and water use by horticultural processing MSMEs over a short period of time that may be regarded as a single point in time.

Sample Size and Sampling Procedure

A baseline survey was conducted to establish the feasibility of this research work. Three hundred MSMEs who met the prescribed criteria were identified from a sampling frame and trained on sustainable consumption and production practices on energy use efficiency, water use efficiency as well as waste management. These MSMEs were located in Nairobi, Western and Central regions of Kenya. After the training, site visits assessments were made to ascertain the existence of these MSMEs as well as for monitoring and evaluation purposes. MSMEs were mapped and thereafter the prescribed criteria for their inclusion in this study were applied. The prescribed criteria included having a company registration, Kenya Bureau of Standards Certification, public health license, at least three years in horticultural processing, regular frequency of processing–at least twice a week and desire to attain environmental management system (EMS) certification. Out of the 300 MSMEs that had been identified and trained, only 122 MSMEs met the criteria and were assessed during the baseline survey. After the baseline survey only 61 MSMEs were identified to proceed to the next level. Further screening was done and only MSMEs able to provide data on energy and water

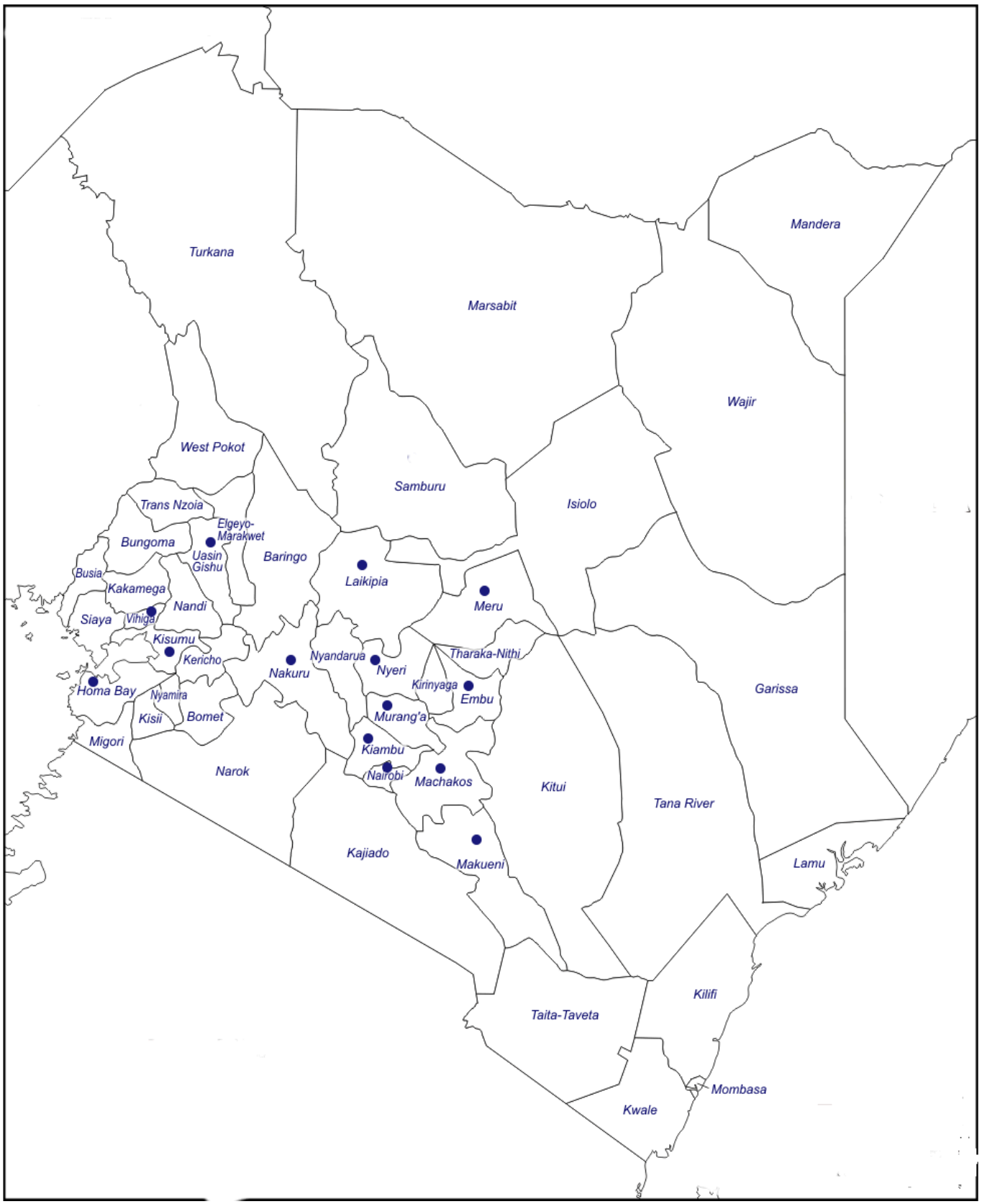

Figure 1. Map of Kenya showing the study areas marked in blue dots

used for processing were selected. Thirty-nine MSMEs met the criteria and were purposively selected to be interviewed.

Data was collected through face-to-face interviewing of MSME representatives. The selection of the interviewee was further based on their expertise, that is, only MSME personnel with three years of experience within the selected MSME, in addition to having information on operations and financial status of the MSME were interviewed. Face to face interviews were preferred so as to establish an atmosphere of trust through the ensuing discussion. Data was collected from December 2019 to March 2021. All the 39 questionnaires were

correctly completed and returned, providing a response rate of 100%.

Data Collection and Analysis

Primary data was obtained using a questionnaire, structured interviews and observations. The questionnaire contained both open and closed ended questions. Interviews were also used and entailed using prearranged questions and standardized methods of recording (Kothari, 2004). Secondary data was collected from various sources including published reports, journal articles, and research project reports among others. Data was collected using ODK software.

Data was edited, coded, entered and classified. Before the analysis of data was done, the data was tested for normality using Shapiro-Wilk test for normality so as to establish whether to use non-parametric or parametric tests. The Shapiro-Wilk test found out that the data was not normal thus Pearson correlation and linear correlations were used to determine the relationship between knowledge, attitude and practice and energy and water use efficiency. Descriptive statistics such as frequencies, standard deviations and percentages were also determined.

Methods of Scoring

Knowledge

The section on knowledge comprised multiple-choice questions to enable the researcher establish the general knowledge of MSMEs on efficient energy and water use for processing. This section had 10 questions on knowledge on efficient energy use as well as 10 questions on knowledge on efficient water use. One mark was assigned for every correct answer and no mark was given for a wrong answer. Total score ranged from 0 to 20; this was then converted into a percentage and classified into the three levels of knowledge The overall knowledge score was categorized using Bloom's cut off point as high if the score was between (80%-100%), moderate (60%-79%), and poor level of knowledge if the score is less than 60% (Feleke et al., 2021).

Attitude

This section of the questionnaire contained 29 statements that tested MSMEs attitude towards energy and water bills incurred by the MSMEs, efficient use of energy, efficient use of water, role of science in solving energy and water crisis in Kenya and general perception of the respondents towards the environment. The respondents were asked to choose a response based on a 5-point Likert scale. A mean score of three was computed through addition of the weighted points of the likert scale and dividing it by five that is 1+2+3+4+5 equals 15 then 15 divided by 5 equals to 3. Thus, a response was considered positive if it scored a mean score that was equal to or greater than three and it was considered negative if the mean score was less than three (Jatau, 2013).

Practices

The MSMEs were asked to select the practices they have been adopted in their enterprises towards energy and water use efficiency. There were two sub-sections on practice; the first sub-section was on energy conservation practices while the second sub-section was on water conservation practices. The MSMEs were required to indicate either yes or no on each question posed on practices. The response yes denotes the practice that has been adopted by the MSMEs while the response 'No' indicates that the MSMEs has not taken up this practice yet.

RESULTS

Demographic Characteristics of MSME Representatives

The MSMES surveyed were located in Nairobi, Kiambu, Nyeri, Makueni, Laikipia, Nakuru, Murang'a, Embu, Meru, Kisumu, Homabay, Uasin Gishu, Machakos, Makueni, and Vihiga counties. **Table 1** indicates the demographic characteristics of the MSMEs representatives interviewed (respondents). More than half of the respondents were males, that is, 61% whereas females constituted 39%. A majority (46%) of the MSMEs representatives interviewed fell under the age group 36-50 years. Most (82%) of the MSMEs representatives interviewed had completed tertiary level of education whereas 15% and 3% had completed secondary and primary level of education, respectively. Majority (51%) of the MSMEs indicated that they have been processing for 3-5 years, 36% indicated 5-10 years, 8% indicated 10-15 years while 5% of the MSMEs surveyed had been in processing for over 15 years.

The MSMEs were further asked to indicate the frequency of processing of horticultural produce. A majority of them (41%) indicated they process daily, 20% process 2-3 times a week, 10% process weekly, 3% process fortnightly, 3% process monthly while 23% indicated that they process depending on demand and availability of raw materials and market. Most of the MSMEs (44%) were micro enterprises, 41% were small enterprises and 15% were medium enterprises. **Table 1** summarizes the socio-demographic characteristics of the respondents.

Knowledge, Attitude and Practices

Knowledge

The MSMEs representatives were asked questions to test their knowledge on energy use as well as water use for processing of horticultural produce. All of the 39 MSMEs were rated as having high level of knowledge as shown in **Table 2**. The high level of knowledge of the MSMEs can be attributed to the capacity building training that the MSMEs had undergone. This means that the MSMEs are fully aware and knowledgeable on measures that can be adopted by the enterprises that will help them attain efficiency with respect to energy use and water use during processing of horticultural products not only in the short term but also in the long term thus leading to sustainability of these enterprises.

The MSMEs were asked how use of excessive electricity affects their business and 91% indicated that it results in high electricity bills, 91% further agreed that there is a direct relationship between over-consumption of electricity and decreasing water resources. About 88% of the MSMEs agreed that use of daylight during the day results in considerable savings in the electricity bills while 94% agreed that the use of machines and equipment efficiently results into low electricity

Table 1. Socio-demographic characteristics (n=39)

Socio-demographic characteristics	Variable	Frequency	Percentage (%)
Gender	Male	24	61
	Female	15	39
Age (years)	18-35	15	38
	36-50	18	46
	51-60	5	13
	61 and above	1	3
Education level completed	Primary	1	3
	Secondary level	6	15
	Tertiary	32	82
Frequency of processing	Daily	16	41
	2-3 times a week	8	20
	Weekly	4	10
	Fortnight	1	3
	Monthly	1	3
	On demand	9	23
Number of years in processing	3-5 years	20	51
	5-10 years	14	36
	10-15 years	3	8
	Over 15 years	2	5
Responsibility in the company	Owner	15	38
	Hired manager	24	62
MSME type	Micro (1-9)	17	44
	Small (10-49)	16	41
	Medium (50-250)	6	15

Table 2. Level of knowledge on energy and water use for processing horticultural produce

Level of knowledge	Score	Frequency	Percentage (%)
High level (80-100%)	16-20	39	100
Moderate level (60-79%)	10-15	0	0
Low level (less than 59%)	0-9	0	0

Table 3. Kenyan horticultural processing MSMEs knowledge on efficient use of energy for processing

Question	Correct (%)	Incorrect (%)
There is a direct relationship between over consumption of electricity and decreasing water resources	91	9
How does excessive use of electricity affect your business?	91	9
Efficient use of machines and equipment results into low electricity bills	94	6
The use of daylight during daytime leads to significant electricity savings	88	12
Use of worn-out appliances causes high energy consumption	97	3
Use of renewable energy can lead to a reduction in cost of energy	97	3

Table 4. General knowledge on efficient use of water by horticultural processing MSMEs in Kenya

Question	Correct (%)	Incorrect (%)
Water used for processing must be safe to drink or to use in food preparation	97	3
Reuse of water leads to: reduced amount of water consumed	97	3
Installation of meters and sub meters helps to monitor and reduce on water consumption	97	3
Inspection and replacement of faulty valves and fittings leads to:	70	30
Water recycling helps to: reduce fresh water consumption	79	21

bills. The MSMEs responses to questions testing their knowledge on efficient use of energy is shown in **Table 3**.

The MSMEs were further asked questions to assess their knowledge on efficient use of water for processing of horticultural products. The findings indicate that 97% of the MSMEs were aware that reusing of water leads to reduction in the amount of water consumed, 79% were aware that water recycling helps in minimising the amount of fresh water consumed and inspection of faulty valves and fittings helps in preventing water loss.

The MSMEs responses to questions testing their knowledge on efficient use of water is shown in **Table 4**. The high level of knowledge of the MSMEs shows that the Hortigreen Project which has been holding capacity building workshops and trainings had improved the knowledge and awareness of MSMEs on energy and water use for processing.

Attitude

Out of the 29 statements posed on attitude, 22 statements scored a mean score equal to or greater than three meaning the responses were considered positive while seven statements had a mean score of less than three; hence, the responses were considered negative (**Table 5**).

The findings indicate that 76% of the respondents had a positive attitude towards the environment. The MSMEs displayed a pro environmental behaviour as deduced from

Table 5. Kenyan horticultural MSMEs attitude towards energy and water use for processing

No	Question	Mean	Standard deviation
1	Saving water is the company's responsibility and not mine.	1.53	0.788
2	Saving energy is the company's responsibility and not mine.	1.38	0.638
3	I use water as I please when it is adequately available.	1.50	0.707
4	I use energy as I please when it is adequately available.	1.50	0.826
5	I am willing to conserve water.	4.59	0.783
6	I am willing to conserve energy.	4.59	0.783
7	Water will eventually be scarce if we do not conserve it.	4.38	0.853
8	Energy will soon be in short supply if we do not use it efficiently.	4.24	1.046
9	I am concerned about the high electricity bills incurred by the company.	3.97	0.937
10	I am not bothered about the high-water bills incurred by the company.	2.12	1.274
11	I care about the company's environmental image.	4.50	0.896
12	I do all I can to efficiently use water.	4.56	0.786
13	I do my best to efficiently utilize energy.	4.56	0.790
14	I am willing to reuse water for environmental reasons.	4.50	0.788
15	I am willing to recycle water for environmental reasons.	4.56	0.561
16	I care for the environment.	4.56	0.660
17	I think that Kenya is a water scarce country.	3.29	1.115
18	I think that there is an energy crisis in Kenya.	3.06	1.043
19	Human beings are over exploiting the environment.	4.24	0.781
20	Human beings are meant to rule over nature.	3.29	1.315
21	The earth has sufficient resources only if we use them efficiently.	4.29	0.836
22	Plants and animals have as much right as human beings.	4.24	0.923
23	The environment is sacred.	4.38	0.739
24	Renewable energy is good for the environment.	4.41	0.701
25	The solution to the energy problem lies in science.	2.91	0.996
26	Science holds the solution to the water crisis in Kenya.	2.88	1.008
27	Making the company energy efficient is good for the environment.	4.26	0.828
28	I worry that the company does not have enough money to pay electricity and water bills.	3.24	1.208
29	Use of efficient equipment saves energy as well as water.	4.26	0.828

Table 6. Energy conservation practices of Kenyan MSMEs

No	Energy conservation practices	Yes (%)	No (%)
1	Regular preventive maintenance of equipment	91	9
2	Proper loading and operation of equipment	91	9
3	Replacement of older components and equipment with higher efficiency models	82	18
4	Use of signage and guides to remind staff on good practice	74	26
5	Conducting regular energy audits	53	47
6	Using renewable energy: a. Biogas b. Wind power c. Solar energy	27	73
7	Process control and optimization to ensure production operations are running at maximum efficiency	88	12
8	Implementation of energy management systems that ensures involvement of management and staff towards efficient use of energy	91	9
9	Reusing hot water	41	59
10	Regular training of staff on energy use efficiency	82	18
11	Channelling back steam condensate to the boiler	21	79
12	Installing energy efficient electric motors	77	23
13	Turning off idle motors	85	15
14	Installing correctly sized equipment	88	12
15	Use of energy efficient bulbs	85	15
16	Reusing cooling water	32	68

their responses. About 90% of the MSMEs representatives interviewed disagreed that saving energy is the responsibility of the company and not theirs, 93% disagreed that saving water is responsibility of the company and not theirs, 93% disagreed that they use water as they please when it is adequately available, 97% indicated that they were willing to conserve water and energy, 89% agreed that water will eventually be scarce if it is not conserved, 71% agreed that they were concerned about the high electricity bill incurred by their respective companies. About 81% further agreed that human beings were over exploiting the earth.

Practices

Table 6 summarises the responses from the MSMEs representatives who were interviewed on the energy conservation practices that they have adopted.

In reference to energy conservation practices, the findings indicate that all of the enterprises have adopted most of the simple housekeeping measures to achieve energy and water use efficiency. About 89.3% of the MSMEs practice regular preventive maintenance of equipment, 89.3% indicated that they practice proper loading and operation of equipment, 71.4% use signage and guides to remind staff on good practice, 86% use energy efficient bulbs. When asked if the MSMEs switch off lights when not in use, they all indicated that they

Table 7. Water conservation practices of Kenyan MSMEs

No	Water conservation practice	Yes (%)	No (%)
1	Proper and regular maintenance of equipment	94	6
2	Raising staff awareness on need for proper maintenance of equipment	97	3
3	Installation of a condensate water reuse system	21	79
4	Turning off taps when not in use	97	3
5	Implementation of a strategic water management program that ensures involvement of management and employees towards efficient water use	88	12
6	Water recovery from the various operations	35	65
7	Reusing water where possible	79	21
8	Using dry cleaning methods to clean equipment and surfaces	82	18
9	Conducting regular water audits	53	47
10	Water recycling	18	82
11	Inspection and replacement of faulty valves and fittings	88	12
12	Installing water meters on equipment to enable monitoring and reduction of water consumption	68	32
13	Inspection of all water connections for leakages with prompt repair of leakages	85	15
14	Keeping spray nozzles free of dirt and scale	56	44
15	Installing water efficient building fixtures	59	41
16	Pre-soaking floors and equipment before cleaning	71	29

Table 8. Correlation between knowledge, attitude, and practice

Level	Pearson correlation	p-value
Knowledge-attitude	0.316	0.053
Attitude-practices	0.247	0.134
Practices-knowledge	0.038	0.819

Table 9. Multiple linear regression

Variables	Knowledge			Attitude			Practices			
	C	SE	p-value	C	SE	p-value	C	SE	p-value	
Education level	-0.010	0.136	0.941	-0.069	0.035	0.060	0.007	0.024	0.762	R^2=0.337; F=1.451; P=0.245
Frequency of processing	0.293	0.365	0.428	0.058	0.095	0.544	0.018	0.065	0.780	R^2=0.048; F=0.573; P=0.637
Gender	-0.043	0.089	0.634	-0.022	0.023	0.348	0.012	0.016	0.466	R^2=0.051; F=0.608; P=0.614
Age	-0.308	0.122	0.066	0.090	0.032	0.008	0.015	0.022	0.493	R^2=0.272; F=4.238; P=0.012
MSME type	0.017	0.152	0.911	0.042	0.040	0.295	-0.058	0.027	0.041	R^2=0.128; F=1.665; P=0.193

Note. C: Coefficient; SE: Standard error

do. However, switching off lights when not in use was observed in 92% of the MSMEs that were visited.

Regarding water conservation practices, the MSMEs gave their responses as follows: 97% turn off taps when not in use, 79% reuse water where possible, 82% use dry cleaning methods to clean equipment and surfaces, 86% indicated that they inspect and replace faulty valves and fittings, 82% inspect water connection points for leakages and promptly repair any identified leakages. Majority (53%) of the respondents indicated that they carry out water audits. The various efficient water usage practices adopted by MSMEs are presented in **Table 7**.

Results from the Pearson correlation analysis (**Table 8**) indicates a positive moderate correlation, r=0.316 between knowledge and attitude though not statistically significant (p=0.053). A weak positive relation, (r=0.247), exists between attitude and practices; and practices and knowledge (r=0.819) however, this relationship is not statistically significant, (p=0.134) and (p=0.819), respectively.

From the analysis done as displayed in **Table 9**, age is the only variable that has an effect on the knowledge, attitude and practices on energy and water use of MSMEs. An increase in age is associated with an improvement in knowledge, attitude and practices on energy and water use for processing (R^2=0.272; F=4.238; P=0.012).

DISCUSSION

Environmental knowledge is described as possessing and comprehending issues related to the environment. Environmental knowledge places emphasis on the awareness of individuals on issues connected with collective responsibility as well as environmental appreciation and influence (Kim et al., 2018). The findings from the study established that all the MSMEs had high level of knowledge on efficient use of energy and water. It is difficult for an individual to care and be aware about environmental issues or act pro environmentally responsible if they lack knowledge about the environment (Paillé & Boiral, 2013). This means that possessing knowledge is the first step to acting or caring about environmental issues such as energy and water conservation. Kim et al. (2018) say that environmental knowledge promotes awareness and leads to positive attitude towards nature.

According to Blankenberg and Alhusen (2019), possessing environmental knowledge increases the prospects of environmentally responsible behaviour. The present study agrees with this finding. This means that for MSMEs to be able to efficiently use energy and water for processing, they must be knowledgeable about environmentally responsible energy and water use practices. It has further been established that there is a positive association between environmental knowledge and energy saving behaviours (Pothitou et al.,

2016). Measurement of knowledge as well as attitude of human beings with respect to a specified intervention in the course of the implementation phase of a program may not yield accurate information concerning behaviour change but maybe useful in measuring potential impact (Wasonga et al., 2014). The present study gives an insight on the influence of a sustainable consumption and production intervention program concentrating on MSMEs knowledge, attitude, and practice towards energy use as well as water use in horticultural processing MSMEs.

However, knowledge does not always essentially mean sustainable environmental practices. The findings of this study indicate non-significant relationship between knowledge and energy and water use efficiency practices of MSMEs. This means that despite the MSMEs possessing good level of knowledge on energy and water use efficiency, it does not automatically lead to adoption of best practices aimed at energy and water use efficiency. The findings of this current study resonates with the findings from Ahmad et al. (2015) in a study, which sought to establish the environmental knowledge, attitude, practice and communication of university students. The study established that even though students had a good level of knowledge, it did not spur them to take up the correct ecological practices. Even though environmental knowledge does not have visible effect on pro environmental behaviours or practices, it has significant indirect effects on pro-environmental behaviours with environmental attitudes as an intermediary (Liu et al., 2020).

Besar et al. (2013) also found out that despite young civil servants in Malaysia possessing good level of knowledge and positive attitudes towards the environment, the practices adopted were only moderate. Notwithstanding the excellent knowledge possessed by the MSMEs on water and energy use efficiency, a number of the MSMEs surveyed do not apply this knowledge in practice. Though the MSMEs are aware that practices such as switching off the lights during the day leads to energy savings, a number of them leave lights on during the day and idle machines are not plugged off. In addition, in spite of the high significance of costs of energy to MSMEs they largely lack the resources or time to dedicate to this area (EuroChambers, 2010).

The findings of the present study further indicate that only 53% of the MSMEs conduct energy audits as well as water audits regularly yet conducting energy and water audits regularly results in notable cost savings. According to research conducted by Fleiter et al. (2012), it has emerged that technical methodology is many a times employed when carrying out energy audit programs and this method leads to errors by MSMEs as they try to manage their energy resources. Energy audits are frequently done by professionals mostly with a background in engineering (Fleiter et al., 2012) and handed over to MSMEs which might lack a comparable background knowledge thus making it hard for the MSMEs to understand the results of the audit (Palm and Backman, 2020). Insufficient knowledge is a barrier to MSMEs implementing audit findings.

An MSME must aggressively process information within the organization, in turn its personnel are obligated to control their individual learning processes by choosing and arranging fitting information and constructing connections to existing knowledge (Thollander and Palm, 2015). Thus, the prime aim of policy programs should be to support MSMEs to progress their knowledge skills and then assist them utilize these skills to conceptualize useful knowledge in appropriate areas (Mayer, 1992). The Government should also mount additional educational programs geared at enhancing the knowledge of MSMEs on pro-environmental behavior given that possession of environmental knowledge is the first step towards acting in a pro environmental manner. MSMEs cannot adopt best practices in energy and water use if they lack the knowledge on these practices.

Despite MSMEs positive attitude towards environmental issues, they do not participate in environmental issues (Weerasiri and Zhengang, 2012). This point is further expounded by a study by Tilley (1999) on MSMEs environmental behaviour and attitudes which established that MSMEs do not have sufficient motivation to transit from pro environmental attitude to behaviour (Tilley, 1999). Thus, positive attitude towards environmental issues in this case energy and water use efficiency does not translate into adoption of best practices that will help MSMEs achieve sustainability in energy and water use. The present study established that the MSMEs had a positive attitude towards energy and water use efficiency.

Further the findings of the present study indicate a moderate but positive relationship between attitude and energy and water use practices of MSMEs. Thus, to some extent attitude influences the energy and water use practices of MSMEs. This finding is in line with a finding by Weerasiri and Zhengang (2012) whom established that there is little or no significant relationship between attitude and practices. This means that MSMEs attitudes appear to remain positive even where there is inadequate implementation of best environmental practices

Majority of the MSMEs (91%) have implemented a strategic energy management program that ensures involvement of management and employees towards efficient energy use; on the other hand, only 88% of the MSMEs have implemented a strategic water management program that ensures involvement of management and employees towards efficient water use. According to Sachidananda et al. (2016), less effort has been placed on management of water as compared to management of energy. Water minimization strategies range from adoption of good housekeeping measures, conducting water audits to process and product redesign.

Housekeeping measures are among the measures to achieve energy conservation opportunities and incurs absolutely no or little cost; these measures can be described as a brilliant starting point for advancing methods of operation. These measures can be employed to conserve energy, lessen production costs, curtail wastage of raw materials, reduce waste, save water and alleviate environmental impact (Zohir, 2010). Abolarin et al. (2014) said that adoption of practices such as monitoring of energy consumption, turning off equipment when not in use and replacement of incandescent bulbs with energy saving bulbs results in energy savings.

Given the diminishing energy supplies, it's imperative that energy conservation practices be adopted as a preliminary measure and increase uptake of energy efficient technologies as a long term measure (Mills and Schleich, 2012).

CONCLUSION

The findings from this study indicate that the MSMEs have high level of knowledge on energy and water use for processing. However, this high level of knowledge has not spurred the MSMEs to adopt long term sustainable consumption and production practices that will ensure sustainability in this industry in the long run. Further, the findings from the study indicate that the MSMEs are not adequately motivated to transition from positive attitude towards energy and water use to practices. The study thus recommends government subsidies and rewards to encourage MSMEs to adopt efficient energy and water use practices.

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