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Voluntary approaches to water resource management among flower growing firms in Naivasha Sub County, Kenya

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ABSTRACT

Flower growing firms are key economic players in Kenya contributing to a large portion of the country's Gross Domestic Product. While government regulations have faced accusations of laxity in managing the firms, the former have gradually embraced voluntary measures to aid in enhancing their water resource management goals. This study aimed to uncover the nature of the programs put in place by the firms. A cross sectional survey research design was adopted for the study that was conducted in Naivasha Sub County, an area dominantly known for flower growing firms in the country. Chi square test of independence was done to uncover any statistically significant differences between the flower firm types and their perception of the various voluntary approaches towards water resource management. A null outcome was observed whereby the views of the firms were not influenced by their geographical sizes of operation. While all the flower growing firms acknowledged the importance of voluntary efforts to water resource management, some lacked clear structures on implementation of the same. The firms were reluctant to share documentation pertaining to their policies although responses obtained indicated that the efforts were still at an infant stage. It has been noted that many flower firms enroll for voluntary programs like certification schemes simply for the purpose of gaining access to markets. The study therefore recommended that the water resource management rules set out in the voluntary approaches need to be made compulsory and monitored by parties outside of the value chain.

1. Introduction

The concept of voluntarism is based on individual firms' undertaking to do the right thing independently without being coerced. In certain occasions it is initiated by government and may involve government playing the role of facilitator and coordinator. It has been observed that voluntary mechanisms complement most command and control regulation approaches. A combination of the two instruments implies that the firms involved exceed a minimum expectation while the non-participating firms are expected to comply with the performance baseline (Drahos, 2017).

The case in practice shows that legislation has been inadequate in addressing matters of resource management in different scenarios. It has been noted that laws enacted in Ethiopia to address flower sector activities are insufficient with gaps in the sphere of application leading to poor attention to issues of flower farms' waste disposal (Kassa, 2017). The floriculture industry involves the uses of pesticides and chemical fertilizers that cause adverse effects on the environment. It is also characterized by intensive water use with consumption reaching 60,000 l /ha /day. In Ecuador, this has resulted in conflicts between the farms and the neighboring communities due to depletion of the available water sources (Kassa, 2017).

The occurrence of self regulation has continued to rise in attempt to fill the above gap, involving industry level organizations, as opposed to government or individual firms, setting rules and standards relating to the conduct of firms in the industry (Drahos, 2017). The Ethiopian Horticulture Producers and Exporters Association developed its own Code of Practice in 2007 to help achieve sustainable development of the sector. This is a self regulatory framework whose members are expected to observe environmental compliance standards in the course of their activities (Kassa, 2017). A research study done in China indicated that mandatory environmental regulations bear a significant negative effect on green innovation while voluntary environmental programs significantly positively influenced green innovation among corporate entities (Li et al., 2020). However, due to their origin in the developed countries, most research has tended to focus mainly on programs and factors

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relevant to developed nations (Tambunlertchai, 2020).

Among the major flower varieties grown and exported from Kenya are Roses, Carnation, Alstroemeria, Lisianthus and cut foliage. A 2007 report from the Horticultural Crops Development Authority indicated that Rose flowers dominate the export market accounting for over 70% of the export volume. Certification and labeling standards such as GlobalGAP are popular in Kenya and many other developed and developing nations with member farmers reported to have benefited from compliance through increased access to market, increased productivity and reduced cost of production through sustainable techniques (Becht et al., 2012). Little research has been done on the direct and indirect consequences of voluntary certification on water resource use and conservation. While this is recognized as an important issue it has not received much attention in international certifying schemes until recently (Boelens and Rutgerd, 2014).

1.1. Problem statement

It is undeniable that the Lake Naivasha Basin has continued to experience tremendous pressure from the numerous water stakeholders with different interests in the Lake's resources. The pressure on this resource is said to have resulted in unsustainable resource management practices, poor water quality and emergence of conflicts between institutions and its users. Studies have revealed that vague county and national institutional structures, fragmented land use activities and marginalization of the local communities have contributed to conflicts within the basin concerning the resources available (Opiyo and Renner, 2021).

The implementation of some forms of regulation has been hampered by reluctance of many water users to follow the regulation and difficulties that the government encounters in enforcing the regulation. Pricing water at its full marginal cost, for example, is a key economic instrument enforced through regulation but has been difficult to achieve in Kenya for a number of reasons. Flower growing firms claim to be overtaxed already and major water users are required to have a license to abstract water and install water meters (Becht et al., 2012). Mandatory regulatory approaches have often been criticized for their weakness resulting from their uniform mandates, increasing costs of monitoring and enforcement and the divide they create between regulators and polluters (Tambunlertchai, 2020).

The gaps in existing literature compounded by the continued growth of voluntary programs among the developing countries implore the need for further research on their effectiveness in this context (Tambunlertchai, 2020). According to Callery (Callery, 2021), voluntary environmental programs are centralized or decentralized institutions developed to address defined issues of corporate environmental impacts, management or performance recognizing participation by firms on a voluntary basis. These can include government initiatives, information disclosure programs, industry self-regulation programs, environmental management systems and product or process certification systems. In hindsight, this research study aimed to gain a better understanding of voluntary water resource management in Naivasha Sub County through the following programs; corporate environmental policy, corporate code of conduct, certification schemes, environmental management systems and sustainability reporting.

1.2. Objective

To examine the voluntary approaches adopted towards water resource management among flower growing firms in Naivasha Sub County, Kenya.

1.3. Research question

How are voluntary approaches incorporated into the flower growing firms' water resource management agenda and activities?

1.4. Scope of the study

Voluntary programs in the realm of corporate responsibility action have continually diversified (Tambunlertchai, 2020) imploring the need for further research on their effectiveness in water resource management. In this study, the theme of voluntary approaches was elaborated through the following voluntary programs as identified among corporate entities (Callery, 2021):

1.4.1. Environmental management systems

An environmental management system consists of a number of interrelated elements that function together to achieve the objective of efficiently managing a company's activities that affect the surrounding environment. The aim of the ISO (Organization for Standardization) standards and Eco-Management and Audit Scheme (EMAS) is standardization in the field of environmental management systems by providing guidelines that optimize the context of environmental management systems. ISO4001 is dominantly used in Europe (Morrow and Rondinelli, 2002). It has been reported that lack of financial and human resources, lack of market and stakeholder recognition have contributed to an overall decrease in the adoption of EMAS (Daddi et al., 2018).

1.4.2. Sustainability reporting

It has been noted that corporations within the producing sector or those reporting higher profit margins produce higher quality sustainability reports than their counterparts (Dilling, 2010). The report analyzes the company's economic, environmental and social aspects and the manner in which it governs itself. The best known voluntary framework for sustainability reporting is the Global Reporting Initiative (GRI) (Alonso-Almeida et al., 2013).

1.4.3. Corporate code of conduct

These refer to a set of principles that a company commits itself to adhere to. The design used in setting up the standards varies greatly but are voluntary and not subject to legal enforcement (Jude, 2013). An assessment of the codes of conduct of some world leading gold mining revealed that 93% of the codes take environmental related notions into consideration and although thematically diverse, are of high quality (Ruban and Yashalova, 2021).

1.4.4. Corporate environmental policy

These set the base for an environmental management system by detailing specific objectives and targets to enable monitoring of stated commitments (Christopher, 1996). There are two main types based on origin of development. A policy may be developed by an outside body and be subscribed to by various organizations or it may be an 'in-house' charter developed by the company itself (Tilt, 1998).

1.4.5. Voluntary certification schemes

Certification is said to have become a core aspect of many voluntary schemes in agriculture. It is a procedure utilized by a third party to provide assurance that a product abides to a given set of standards. It is a means of communicating to the buyer across a supply chain that the products meet crucial standards which gives more assurance than that provided by the supplier alone. Examples of certification schemes include Global G.A.P that is prominent for crop produce and Fairtrade International prevalent among small producer organizations (Henry and Pechevy, 2017).

2. Materials and methods

2.1. Research design

Cross sectional survey design was adopted for the study to give a picture of what the researcher intended to study at the given time (Beck and Polit, 2014). The design was considered due to its flexibility and

relative ability to enable quick collection of data needed on the current scenarios. It is also relatively inexpensive compared to other types of research (Connelly, 2016). The above research design provided a platform that enabled the researcher study the voluntary efforts in existence among the flower growing firms in relation to their water resource management goals.

2.2. Study area

The study was conducted in Naivasha, a sub county within Nakuru County, Kenya. This is an area popular with flower growing in the country with an estimated size of 4500 ha worth of irrigated commercial farm area (KNBS and SID see: Kenya National Bureau of Statistics and Society for International Development, 2013). Four out of the eight wards in the County formed the focus of the study due to their location properties that created a basis for comparison of the data collected among the different locations. These were Olkaria, Viwandani, Hells Gate and Maiela Wards. The flower growing firms' management within the Wards, concerned government and private bodies formed the target population of the study as shown in Table 1 below. The study incorporated two-stage cluster sampling and purposive sampling to approach the intended participants for the required data (Ahmed, 2009). Viwandani, Olkaria, Maiela and Hells Gate Wards formed the primary sampling units as they displayed the largest flower farming acreage in Naivasha Sub County as shown in Fig. 1 below. The number of flower growing firms i.e. secondary sampling units to be used in the study, as obtained from the primary sampling units, was determined in proportion by the sample size acreage for each Ward as shown in Table 1. Categorization based on the individual flower growing firms' geographical locations and sizes was subsequently applied to make comparisons on the various aspects of the voluntary water resource management approaches identified in the study.

Table 1
Sampling frame.

Unit of study	Total flower farm area /resident population within study area	Sampling strategy	Sample size
County wards		Two-stage	
	21.8 ha	cluster	19.59 ha
• Viwandani	21 ha	sampling	18.87 ha
• Olkaria	2.6 ha		2.34 ha
• Maiela	1.75 ha		1.57 ha
• Hells Gate			
Government agencies		Purposive sampling	
• National Environment Management Authority (NEMA)			
• Horticultural Crops Development Authority (HCDA)			
• Water Resource Management Authority (WRMA)			
Private/civil society agencies		Purposive sampling	
• Lake Naivasha Riparian Organization			
• Kenya Flower Council (KFC)			
• Fresh Produce Exporters Association of Kenya (FPEAK)			
Source: Kenya Census, 2009 data in KNBS & SID (2013); World Resource Institute, 2019			

2.3. Data collection

2.3.1. Document content analysis

Document content analyses involving extensive literature review of verified reports, journals, papers and articles, desktop review of company and government websites was done to provide more insight on the objective of the study.

2.3.2. Data schedules

Data schedules were handed out to participating individuals from the local population. The researcher engaged the participants directly to obtain data relevant to the questions set out on the schedules.

2.3.3. Interviews

Telephone and face to face interviews were conducted on the target population consisting of government and private / civil society agencies and the flower firms 'management to seek factual information, opinions and attitudes in relation to the objectives of the study.

2.4. Data analysis

A Likert scale was used to assign values to the perceived state of the management of water resources resulting from the voluntary approaches, namely: voluntary certification, corporate environmental policies, corporate codes of conduct, environmental management systems, and sustainability reporting. This was achieved by assigning nominal values to the non-numerical data collected (Mugenda and Mugenda, 2003). The Chi Square statistic was applied to investigate whether the variation in opinions concerning the different voluntary approaches in water resource management was influenced in any way by the type of flower growing firm (based on size as dictated by the samples collected).

3. Literature review

It is common belief that integrated approaches to water resource management make effective management tools for sustainable use of water resources. Participatory approaches have been promoted in integrated water resource management studies as they have been observed to enhance the goals of sustainability (Lukenga, 2015; Avtar et al., 2020; Bloschl et al., 2012). A review of the European Water Framework Directive and the U.S Clean Water Act state that public and stakeholder participation in water resource management is a requisite for democracy and resource management (Bloschl et al., 2012). Participatory approaches are effective in the face of multitudes of organizations sharing resources within a watershed as it provides a framework for water resource management that facilitates regular feedbacks among the different stakeholders which creates a sense of ownership for the results achieved in the joint endeavor (Avtar et al., 2020).

A notable dimension of participatory approaches is the aspect of gender in water resource management. According to the International Water and Sanitation Centre, projects done with the full participation of women are more sustainable and effective than those that don't. This revelation was based on findings from a study done on community water and sanitation projects in 88 communities. The study proceeded to identify public-private partnerships, public participation, economic and regulatory instruments as water resource management tools highlighting that these will only be effective if the political will exists and broader administrative systems are in place (Lukenga, 2015). A study done in Ghana to determine whether socio-demographic groups exhibit different attitudes towards water resource management uncovered that females had higher pro-environmental attitudes than men. The employed reported higher environmental conscious attitudes than students and the unemployed while no evidence was found to support the influence of age and educational attainment on environmental attitudes. It was concluded that socio-demographic factors were likely to moderate

Fig. 1. Map showing the ward locations of study.
Source: World Resource Institute (GIS Data), 2019.

the effect of policies designed to promote sustainable water resource management (Hackman et al., 2020).

Other studies note the importance of integrating social and physical sciences in water resource management. While the contribution of physical sciences through insights from engineering, hydraulics, biology and chemistry are commendable, it is argued that they alone are not sufficient for successful water management. This is a social enterprise requiring efforts from different people working together to build and maintain a complex system. Effective water management therefore requires integrating social and physical sciences which is often triggered informally and motivated more by challenges faced by the communities than theory (Lund, 2015).

Water markets have also been viewed as an attempt to improve efficiency in water use. Majority of Sub Saharan countries are said to consider water as a 'free good' with no formal markets existing for trading the resource. More recently, however, most of the said countries are increasingly recognizing the need for establishing volumetric water pricing and metering. Some have also recognized the need to use measures that protect the environment e.g. pollution taxes and incentives to consumers and suppliers to conserve water in their activities (Bizoza et al., 2019).

At the institutional level, corporate codes of conduct have been used as instruments for promoting socially responsible organizational cultures (Erwin, 2011). Codes are viewed as a way of formalizing and guiding employee behavior. The rise in voluntary codes during the 1990s is attributed to the high occurrence of international environmental damage. The need to avoid government interference is also one of the reasons cited by corporations for adopting voluntary schemes (Bondy et al., 2004).

Voluntary Environmental Programs have been recognized as a potential tool for supplementing existing command-and-control regulations in achieving environmental goals. These are non-mandatory commitments on the part of the firm that aim to improve their environmental performance. They are offered by a country's government or by Non-Governmental Organizations for international participation. ISO 14001 is an example of a certification scheme offered by an international NGO that enlists international participants through the International Organization for Standardization (ISO)'s network of local standards institutes. In Thailand, the Thailand Industrial Standards Institute (TISI) is responsible for overseeing ISO 14001 certification in the country (Tambunlertchai, 2020).

While research studies and practices in environmental reporting have been prominent in South Africa, it has been observed that institutional initiatives encouraging voluntary ecological disclosures are few and far between within the Sub Saharan Africa region. The current scenario indicates that some nations have continued to take deliberate steps to encourage companies issue ecological, social and governance disclosures on a voluntary basis. Stock exchange platforms such as the Nigerian Stock Exchange and the Nairobi Securities Exchange in Kenya are said to champion for sustainability through environmental reporting in Sub-Saharan Africa (Kell and Rodin, 2013).

3.1. Theoretical framework

For a long time, water resource management was considered to be a regulatory domain orchestrated through government functions. A turnaround was observed following inadequacies of the command and control approaches that saw more involvement of different stakeholders in the decision making and management process through decentralization (Krhoda et al., 2017). Arguments have surrounded the concept of decentralization with some schools of thought with the opinion that it is not about formulating a top down reform package to transfer power from the central government to other actors to manage water resources, nor is it about promoting the 'bottom up' agency. According to new institutionalism, decentralization represents a complex adaptive process that involves a combination of natural and political sets of actors and agents who draw on existing structures to negotiate and renegotiate the existing unequal power relations in water management. A study carried out in the Indian Himalayas reveals that contemporary top-down decentralized reforms, though have helped actors to voice their concern and empowered the agents to remain adaptive, they have not ensured resource use efficiency, addressed poverty or promoted greater participation of the actors (Saravanan, 2009).

From the context of developing versus developed nations, the objective of voluntary programs in industrialized countries is to promote beyond compliance with existing environmental regulations, while for developing countries, the efforts are orchestrated towards combating rampant non-compliance for regulations. For developing countries characterized by smaller economies, the influence of the international community is held in high regard while in developed countries, the influence of international factors is felt less strongly with domestic influences more pronounced. Another contrast is observed concerning environmental regulations that are usually less stringent and legal structures weak with low budgets for government operations among the developing countries. This is significantly different from the context in which firms based in the developed countries operate. Regulatory power in most developed countries is known for being strongly influenced by public sector interest. It is suggested that since several factors are different for voluntary programs operating in the context of developing countries, voluntary approaches in such countries should be separately considered from those in more industrialized countries (Tambunlertchai, 2020).

The economic theory views participation in voluntary programs as an irregularity in the business environment. Since actions aimed at mitigating negative environmental consequences impose costs on firms while the benefits are positive externalities, the theory analyses that firms will only abate to the level required by existing regulations. The theory reaches an impasse in the case of developing countries with low regulatory requirements and limited monitoring and enforcement. It reasons that pollution emissions will be uncontrolled, yet in reality, several firms in the developing world have opted to take part in voluntary environmental initiatives some of them more stringent than their counterparts in the developed countries (Tambunlertchai, 2020).

According to the regulatory influence theory, adoption of voluntary initiatives is viewed as an attempt to influence or manipulate the regulatory system. In the case of developing countries where regulatory monitoring and enforcement is hampered by insufficient financial resources and lack of personnel, firms have sufficient opportunities to influence regulations in their favor. Firms may also be able to influence the regulatory process itself (Tambunlertchai, 2020).

The club theory suggests that participation in voluntary initiatives such as ISO 14001 can be seen as membership in green clubs. By becoming members, firms derive mutual benefit in terms of the reputation associated with the 'brand image' of the club. Participating in voluntary programs generates private benefits for firms mainly in terms of improved production efficiency and a reduction in costs (Tambunlertchai, 2020). A concept related to this theory is that of voluntary sustainability standards which form part of the scope of global environmental governance that involve new partnerships between governments, private companies and non-governmental organizations (NGOs). These standards encompass an array of instruments ranging from NGO-led certification to company codes of conduct (Lambin and Thorlakson, 2018). From this school of thought, governments, private companies and NGOs interact in different ways on environmental governance as shown in the Fig. 2 below:

From the above display there is a rise of parallel and uncoordinated voluntary sustainability standards generated by NGOs and private companies. At inception, it is said that standards compete against each other for market share and legitimacy. With time and evolution, the standards may start to cooperate and even assume complementary roles. Although NGOs and private companies may possess different degrees of power, they depend on each other for legitimacy and sustainability. Governments on the other hand have continued to regain partial control of environmental governance initiatives designed by NGOs and companies. In general, voluntary sustainability standards catalyze the adoption of policies addressing sustainability by companies and governments (Lambin and Thorlakson, 2018).

4. Results and discussion

4.1. Voluntary certification schemes in water resource management

All of the flower growing firms interviewed admitted to being certified with some voluntary local/international environmental programs with the most common programs noted across being GlobalGap, MPS Quality, Fair Trade, KFC and FPEAK standards. An enquiry on the environmental protection standards that the firms are required to adopt as part of the certification programs highlighted a number of aspects. Some of these that were repeated across the firms' responses included detoxification of effluents before release into the environment, redirecting run offs to wetlands, minimizing usage of fertilizers and chemicals, restricting access to wetlands with some instructing a distance of at least 25 m from these areas. Other distinctive measures included putting in place an environmental policy, contracting specific companies to collect hazardous wastes, carrying out environmental audits, tree planting and obtaining an effluent discharge license. A chi-square test of independence confirms that there is no statistically significant difference between the types of flower firms based on size/location and their perception of the effect of voluntary certification on water resource management, $X^2\ (3, N = 4) = 8, P = 0.261$. From Table 2 below, 80% of the flower growing firms concur that the aspects of voluntary certification play a crucial role in promoting water resource management.

It has been reported that recent initiatives to certify agricultural production have shown a keen interest in the consideration of water issues in the agenda of quality assurance, sustainable production and fair trade. However, the private standards have been observed to promote the political and market power of the private sector at the expense of the local water user communities and national governments (Boelens and Rutgerd, 2014).

4.2. Environmental management systems in water resource management

80% of the flower growing firms interviewed admitted to having a certified environmental management system in place with 50% of the responses identifying that this was done in accordance with the Eco-Management and Audit Scheme (EMAS), a voluntary environmental management system that requires inter alia external reporting of environmental impacts (Belal, 2008). In contrast, a study done among European firms by Camino (Camino, 2001) revealed that only 25.4% of the firms made use of EMAS while 74.6% incorporated the ISO 14001 standard. Some of the practices encouraged by the Environmental Management System as noted by the flower growing firms to promote efficiency in water use include tree planting and ensuring efficient water usage. Other technical aspects of the same included adoption of

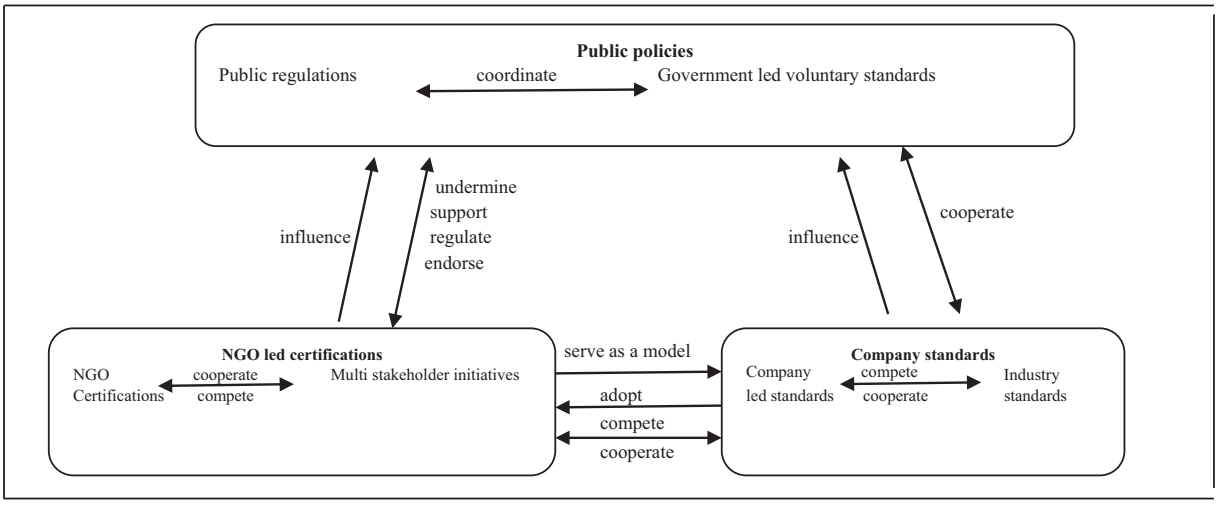

Fig. 2. Interactions between public policies, NGO led certification and company standards (Avtar et al., 2020).

Table 2
Voluntary certification and water resource management goals.

		Voluntary_certification_and_water_resource_management_goals		Total
		Agree	Strongly agree	
Size of flower firm in Hectares	23.0	1	0	1
	29.0	0	1	1
	31.0	1	0	1
	50.0	0	1	1
Total		2	2	4

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.000a	3	0.261
Likelihood Ratio	5.545	3	0.136
Linear-by-Linear Association	1.147	1	0.284
N of Valid Cases	4		

8 cells (100.0%) have expected count less than 5. The minimum expected count is 0.50.

infrastructure such as the hydrophonics system, drip irrigation, computerized irrigation, supply of water storage tanks for employees, constructions of water reservoirs and regular maintenance to avoid leakage in the machine systems used. A chi-square test of independence confirms that there is no statistically significant difference between the flower firm types based on size/location and their discernment of the role played by environmental management systems on the water resource management agenda, X^2 (8, $N = 6$) = 8, $P = 0.238$. From Table 3 below, 60% of the flower growing firms affirm that having a formal environmental management system in place promotes water

Table 3
Environmental management systems and water resource management goals.

		Formal_EMS_and_firm_water_resource_management_goals			Total
		Neither disagree nor agree	Agree	Strongly agree	
Size of flower firm in Hectares	23.0	0	1	0	1
	29.0	0	0	1	1
	31.0	1	0	0	1
	50.0	0	0	1	1
Total		1	1	2	4

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.000a	6	0.238
Likelihood Ratio	8.318	6	0.216
Linear-by-Linear Association	0.581	1	0.446
N of Valid Cases	4		

a. 12 cells (100.0%) have expected count less than 5. The minimum expected count is 0.25.

resource management in the firms' operations.

4.3. Sustainability reporting in water resource management

80% of the flower growing firms interviewed confirmed that they undertake sustainability reporting based on the Global Reporting Index (GRI) standards. This is an international common framework promoting voluntary reporting of economic, environmental and social impact of organization level activity (Belal, 2008). Some of the aspects covered in the reporting practice in relation to water resource management included viability assessments of hydrophonics technology, drip irrigation, integrated pest management, computerized irrigation and application of reverse osmosis technology. A chi-square test of independence confirms that there is no statistically significant difference between the types of flower firms and their perception of the effect of sustainability reporting on water resource management, X^2 (6, $N = 4$) = 8, $P = 0.238$. From Table 4 below, 60% of the flower growing firms agree that sustainability reporting is a key aspect of water resource management.

4.4. Corporate codes of conduct in water resource management

While 80% of the respondent firms admitted to having a corporate code of conduct in place, the role played by employees, firm management and suppliers in promoting efficient use of water could not be clearly identified in all the cases with the firms providing a general note on the need for employees to avoid water wastage in their activities and the firms' management to promote water recycling as per their respective codes of conduct. A chi-square test of independence confirms that there is no statistically significant difference between the types of flower firms and their perception of the role that a code of conduct plays in addressing issues on water resource management, X^2 (1, $N = 2$) = 2, $P = 0.157$. From Table 5 below, 40% of the flower growing firms agree that a comprehensive corporate code of conduct is an effective tool in promoting the goals of water resource management.

4.5. Corporate environmental policies in water resource management

All the flower growing firms confirmed having a formal environmental policy in place. For Maskaant flowers, one of the respondent firms, the objectives laid out in their policy in relation to water management included: to reduce environmental pollution, abide with National Environment Management Authority directive to avoid using plastics and to create a safe and secure environment for the community. While majority of the firms were unable to highlight the objectives in their policy frameworks, they felt at liberty to share examples of activities that they carry out as part of their corporate polices. These included: measuring of effluent component in water utilized on daily basis and sending reports to Water Resource Management Authority, National Environment Authority and Kenya Flower Council; construction of water reservoirs; tree planting and carrying out risk and impact assessments. A chi-square test of independence confirms that there is no statistically significant difference between the types of flower firms and their perception of the role of environmental policies on water resource management, X^2 (4, $N = 5$) = 5, $P = 0.287$. From Table 6 below, 100% of the flower growing firms agree that having an environmental policy in place furthers the firms' water resource management goals.

a. 10 cells (100.0%) have expected count less than 5. The minimum expected count is 0.40.

4.6. The status of voluntary approaches in water resource management by flower growing firms according to government and private agencies

Among the government agencies interviewed, the National Environment Management Authority and Water Resource Management Authority admitted to having in place some voluntary environmental programs with the flower growing firms in mind. Some of the measures identified included promoting rain water harvesting, controlling the use of pesticides to prevent water contamination and encouraging the recycling of waste water. While all the agencies interviewed admitted that voluntary efforts were instrumental in managing proper use of water resources, the Water Resource Management Authority rated this agenda comparatively higher. Conversely, the Horticultural Crops Directorate ranked government laws as most effective in facilitating proper use of water resources among flower growing firms.

Concerning the aspect of flower firms being mindful of the wastes generated in their processes and taking precautions in disposal, the Kenya Flower Council, Horticultural Crops Directorate and National Environment Management Authority agreed that this was the case in practice. When interviewed on whether flower firms work together with communities and other organizations to conserve water and enhance sanitation, the Kenya Flower Council revealed that the parties participate in tree growing activities while the Water Resource Management Authority indicated that the relationship between the flower growing firms and the surrounding communities was mainly built around employment whereby the residents got jobs within the firms.

According to the National Environment Management Authority, very few of the flower growing firms have clear corporate social responsibility programs and mainly support the surrounding communities on need basis. Only the National Environment Management Authority and the Kenya Flower Council agreed that flower growing firms take sufficient measures to mitigate harmful effects on water resources with the Kenya Flower Council providing an example of one of the firms

Table 4
Sustainability reporting and water resource management goals.

		Sustainability_reporting_and_water_resource_management			Total
		Neither agree nor disagree	Agree	Strongly agree	
Size of flower firm in Hectares	23.0	0	1	0	1
	29.0	0	0	1	1
	31.0	1	0	0	1
	50.0	0	0	1	1
Total		1	1	2	4

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.000a	6	0.238
Likelihood Ratio	8.318	6	0.216
Linear-by-Linear Association	0.581	1	0.446
N of Valid Cases	4		

a. 12 cells (100.0%) have expected count less than 5. The minimum expected count is 0.25.

Table 5
Corporate codes of conduct and water resource management goals.

		Firm_code_of_conduct_and_water_resource_management_goals		Total
		Agree	Strongly agree	
Size of flower firm in Hectares	23.0	1	0	1
	50.0	0	1	1
Total		1	1	2

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.000a	1	0.157		
Continuity Correctionb	0.000	1	1.000		
Likelihood Ratio	2.773	1	0.096		
Fisher's Exact Test				1.000	0.500
Linear-by-Linear Association	1.000	1	0.317		
N of Valid Cases	2				

a. 4 cells (100.0%) have expected count less than 5. The minimum expected count is 0.50.
b. Computed only for a 2 × 2 table

Table 6
Corporate environmental policies and water resource management goals.

		Firm_environmental_policy_and_water_resource_management_goals		Total
		Agree	Strongly agree	
Size of flower firm in Hectares	23.0	1	0	1
	29.0	0	1	1
	31.0	1	0	1
	40.0	0	1	1
	50.0	0	1	1
Total		2	3	5

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.000a	4	0.287
Likelihood Ratio	6.730	4	0.151
Linear-by-Linear Association	1.730	1	0.188
N of Valid Cases	5		

having launched an integrated water reserve actions plan that focuses on monitoring water quality.

4.7. Role of stakeholders supporting flower growing firms in water resource management

The flower growing firms had an opportunity to discuss their expectations from the surrounding communities, government and private bodies in relation to water use management. With regard to the neighboring communities it was highlighted that the community members needed to stop sinking boreholes on riparian area and embrace tree planting intensively. The government bodies were challenged to recognize that they were corrupt and hardly enforced laws. They were required to keep flower farms updated on regulation changes, enforce strict measures on water conservation and waste disposal and engage more with the flower growing firms while adopting a more flexible approach. The private certification bodies were encouraged to work more collaboratively with the government to streamline the water resource management agenda and also work closely with the flower growing firms to build local capacities on adoption of latest technologies in floriculture.

5. Conclusion

Voluntary approaches are recognized by both government and private sector agencies as instrumental in enhancing water resource management among flower growing firms. There is a divided perception among the entities concerning the success of flower growing firms in ensuring efficient waste water disposal and collaboration with local communities to conserve water and enhance sanitation. All the flower growing firms engaged in the study confirmed having in place voluntary programs to promote water resource management and not mandated by government regulation. While some of the firms were able to demonstrate their awareness of the programs and their corresponding activities in the firms, some proved to be uncertain, with their contribution to water resource management vaguely defined e.g. the firms' corporate codes of conduct for which the study was unable to uncover a great deal concerning how it was related to water resource management although it was acknowledged by the respondents as a tool that supported the agenda.

6. Recommendations

1. Compliance with the rules set by the above voluntary programs should not be dependent on the need to enter the flower markets but should be made mandatory by the spearheading agencies (Gemahlich and Kulper, 2017). This would aid in making production processes more sustainable as they claim to be. It would also support the formulation of clear thought out objectives and procedures for the achievement of the water resource management goals among the

firms an aspect noted to be lacking from the responses obtained in the study.

2. While it has been recognized that international private certification schemes fail to address spatial and social diversities affecting local livelihood strategies and water control problems (Boelens and Rutgerd, 2014), alternative modes need to be considered based on schemes that acknowledge grass root level diversity and contexts. Sustainability certification can be applied to enable local, regional, national and international organizations of user communities to stake claims and negotiate to protect their water sources and livelihoods.

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Declaration of Competing Interest

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