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ENVIRONMENTAL STANDARDS AND POVERTY ERADICATION AMONG SMALL SCALE FARMERS: THE MODERATING ROLE OF FARMERS' EMPOWERMENT AND ADOPTION OF ENVIRONMENTALLY FRIENDLY PRACTICES

ABSTRACT

PURPOSE

This study examines the influence of the environmental standards set by agro-based processing small and medium sized enterprises (SMEs) on poverty eradication among small scale farmers, and the moderating roles of farmers' environmental empowerment and practice adoption on the environmental standards-poverty reduction relationship.

DESIGN/METHODOLOGY

Data were collected from purchasing managers of agro-based processing firms. Both SPSS and CB-SEM software were used for data analysis. SPSS software was used to obtain results on the influence of the environmental standards set by agro-based processing SMEs on poverty eradication, the moderating role of farmers' environmental empowerment and practice adoption on the environmental standards-poverty eradication relationship.

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Developing nations, including Africa, have changed focus from the United Nations' (UN) 2020 Millennium Development Goals (MDGs) to the UN's 2030 Sustainability Development Goals (SDGs) and the 2063 African Union (AU) Sustainability Development Goals (SDGs). The UN's 2030 SDGs involve addressing the incomplete business of the MDGs and meeting the growing challenges of the interlinked economic, social and environmental dimensions of sustainable development (United Nations (UN), 2015). Building from the perspective of the UN's 2030 SDGs, the AU Agenda 2063 for SDGs includes, but is not limited to, the following goals:

- ending poverty of all kinds;
- transforming the economy through sustainable and inclusive economic growth;
- developing environmentally sustainable and climate-resilient economies and communities;

FINDINGS

Findings indicated that the agro-processing environmental standards of SMEs positively influenced poverty eradication among small scale farmers and farmers' adoption of environmentally friendly agricultural practices. Also, farmers' environmental empowerment moderated the environmental standards-poverty eradication relationship.

LIMITATIONS/IMPLICATIONS

The study mainly focused on agro processing SMEs and small scale farmers. The research has implications for those decision makers in government concerned with enhancing environmentally friendly practices among farmers in general.

- promoting inclusive and sustainable industrialisation and fostering innovation;
- ensuring sustainable consumption and production patterns; and
- revitalising global partnerships for sustainable development (Report of the Commission on the AU Agenda 2063, 2015).

Both the AU Agenda 2063 and the UN's 2030 Agenda for sustainable development offer a unique opportunity for Africa to achieve inclusive, transformative and sustainable development aspirations that are urgent for ensuring a sustainable development path for the continent (Office of the Special Advisor on Africa, 2016).

Environmental emissions are increasing, particularly in the developing world, where pursuing industrialisation is a priority (Geng et al., 2016). Most research on environmental emissions is conducted in developing nations, where the impact of pollution is more severe; these emissions lead to ill health, death and disability in millions of people annually (Borja-Aburto et al., 2000; Oluwasola, 2014). Poverty, inability to invest in modern technology, weak environmental laws and industrialisation combine to create increased pollution levels (Briggs, 2003; Oluwasola, 2014). Industrialisation in developing countries, including those of Africa, is a high priority because there is a need for structural transformation from small-scale agriculture to industrialisation; this is so developing countries can experience inclusive and pro-poor growth (Oluwasola, 2014). However, industrialisation, at least initially, requires a massive use of energy resources; this leads to pollution and environmental degradation (Bruce and Ellis, 1993). Arguably, China would not have achieved its impressive economic growth and development if it had been concerned about pollution in its initial stages of development (Oluwasola, 2014). Although research on green industrialisation is predominantly focused on developing nations such as China and other Asia countries,

ORIGINALITY/VALUE

The influence of agro-based processing SMEs' environmental standards on poverty eradication among small scale farmers, and the moderating roles of farmers' environmental empowerment and adoption of environmentally friendly agricultural practices on the environmental standards-poverty eradication relationship are aspects that have not been given significant attention.

KEYWORDS

Environmental standards; environmental empowerment; poverty eradication; adoption of environmentally friendly agricultural practices; developing countries; small scale farmers; agro-based processing SMEs

many of these nations are well on the way to development (Malviya and Kant, 2015). Less developed nations, such as those on the African continent, have not been given significant research attention.

While the emphasis in previous research has been on industrialisation and climate change issues, industrialisation is just a single component of the entire agricultural supply chain. Approximately 70% of the rural poor rely on agriculture for their livelihoods (United Nations, 2007). In developing countries, it is a major occupational sector and primary source of income for the poor. While agriculture value-added as a percentage of GDP is 3% for the world on average, it is 32% for low-income countries (World Bank Statistics, 2014). Greening the agricultural sector involves increasing the use of farming practices and technologies that simultaneously maintain and increase productivity and profitability while ensuring sustainability of food and ecosystem services, reducing negative externalities, such as environmental emissions, and rebuilding natural capital assets by using resources more efficiently (UNEP, 2011a).

In the downstream chain of agro-based processing firms, customers are interested in food safety and sustainably produced food (Beske et al., 2014). For agro-based food processing firms to accomplish this, pressure is mounting on farmers to improve their environmental management practices. Agriculture is one of the largest global environmental polluters, driving deforestation and contributing an estimated 30% of total greenhouse gas emissions. This necessitates the need to find cost-effective ways of addressing emission problems emanating from the agricultural sector and its supply chains. Minimising such emissions need not compromise other objectives, such as food security, competitiveness and poverty alleviation.

Whereas pressure may be mounting on farmers through the use of environmental standards, the moderating roles of farmers' adoption of environmentally friendly practices and their environmental empowerment on the environmental standards-poverty eradication relationship are under researched. The majority of research focuses on the impact of climate change on, for example, coffee plantations (see Bunn et al., 2015), and supply chain management activities (see Dasaklis and Pappis, 2013). In addition, in the agri-food industry, emphasis is placed on:

- the application of planning models in the agri-food supply chain (Ahumada and Villalobos, 2009);
- good traceability systems that help to minimise the production and distribution of unsafe or poor quality products (Aung and Chang, 2014);
- the role of information technology in agriculture (Ali and Kumar, 2011);
- risk mitigation in the food industry (Diabat et al., 2012); and
- supply chain collaboration in the agricultural industry (Matopoulos et al., 2007).

Therefore, the aim of this research is to discover whether environmental standards of agro-based processing SMEs contribute to poverty alleviation among small scale farmers,

and whether the adoption of environmental practices by farmers and their environmental empowerment moderate the environmental standards-poverty alleviation relationship; the paper uses Uganda as a case study. The paper is structured as follows; this section has provided the background for the research, the next section reviews of literature, followed by sections discussing the methods and findings. The final section provides the conclusions of the research.

LITERATURE REVIEW

This section provides a review of the literature regarding the influence the environmental standards of agro-based processing firms have on poverty eradication among small scale farmers. It also discusses the moderating roles of farmers' adoption of environmentally friendly practices and their environmental empowerment on the environmental standards-poverty eradication relationship.

Environmental standards and practices in Supply Chain Management (SCM) and their relevance to food supply chain

Managing the whole supply chain is important for achieving environmental goals. Supply chain networks are elements that are often ignored when examining environmental aspects of firms (Sarkis, 2001). Today, firms recognise supply networks and use coercive measures on suppliers. Firms that adopt environmental standards engage supply chain partners through assessing their suppliers' environmental impact, requiring them to reduce such impact (Darnall et al., 2008). Although the majority of the research is carried out in chemical, petro-chemical, mining and semiconductor industries, a huge amount of environmental impact may be found nearly in every firm's supply chain, including the agricultural supply chain (Handfield et al., 2005; Zhu and Sarkis, 2004; Zhu et al., 2005). In addition, the influence firms' environmental standards have on other supply chain members is still under researched. While research that focuses on agro-based processing manufacturing firms and their supply chains is scarce, owner/managers of agro-based processing firms are pressurising farmers to adopt environmentally friendly practices. Such pressure arises from food security standards and the international standards that need to be adopted by these farmers. Environmental standards in agro-based processing manufacturing firms promote improvements in their supply chain partners' environmental practices. This is carried out through supplier development and not awarding contracts to farmers that violate environmental rules. Farmers are forced to adopt their practices due to their concerns about losing business.

Environmental standards and poverty eradication

Environmental standards refer to sets of rules, guidelines or characteristics for products or related processes and production methods with which compliance is voluntary, not

legally mandated. These have grown in importance in agriculture and agri-food chains as food consumers and societies have expressed increased expectations regarding the quality of food products and environmental performance in their production (Rousset et al., 2015).

Poverty reduction and environmental protection are two drivers for sustainable development. Sound environmental management is a key to eradicating poverty, and while sound environmental management may curtail economic opportunities and growth, it cannot be treated separately from other development concerns (DFID et al., 2002). Environmental concerns have to be integrated into poverty reduction efforts if significant and lasting results are to be achieved (UNEP, 2011b). However, much of the research cites government as the sole driver for poverty reduction through promoting the adoption of environmental management practices among farmers (see Lovo et al., 2015).

Other research focuses on factors affecting farmers' participation in agri-environmental measures (Defrancesco et al., 2008; Hassan and Nhemachena, 2008), and poverty and environmental degradation (Swinton et al., 2003), while the majority examines environmental practices in agriculture (Ortiz et al., 2008; Pretty, 2007). None of these studies examine the impact agro-based SMEs' environmental standards have on poverty eradication in a supply chain context. Farmers have less trust in the support provided by government as some of the money is embezzled by the government officials in charge, and at times promises made are never fulfilled (Teklewold et al., 2013). The influence or contribution of manufacturing SMEs' environmental standards towards poverty eradication is given limited attention and lacks empirical grounding. Agro-based manufacturing SMEs influence poverty eradication through setting stringent environmental requirements for their farmers (Yu and Bouamra-Mechemache, 2016). Such requirements drive farmers' engagement in environmentally friendly practices.

Environmental management practices benefit the poor through policy and institutional changes in the agro-based manufacturing industrial sector. These changes focus on changing the environmental governance mechanism of the agro-based manufacturing firms and may influence the adoption of environmentally friendly practices among the farmers. Environmental governance mechanisms that require farmers to use environmentally sound and locally appropriate technology contribute to poverty eradication. One example of such technology includes crop production technologies that conserve soil, water and agro-biodiversity, and minimise the use of pesticides (Andreasen et al., 1996). Another example is appropriate renewable energy and energy efficient technologies that also minimise air pollution through improving the protection of, and access to, indigenous knowledge and technologies through improving incentives for pro-poor (Chel and Kaushik, 2011). Therefore, there is a need to establish a link between poverty and the environment, and demonstrate that sound and equitable management of the environment is integral to achieving the Sustainability Development Goals. In particular, to eradicate extreme poverty and hunger, reduce child mortality, combat major diseases, and ensure environmental sustainability. It can therefore be hypothesised that:

H1: Agro-processing SMEs' environmental standards positively influence poverty eradication.

H2: Farmers' adoption of environmentally friendly practices moderates the environmental standards-poverty eradication relationship.

The moderating role of farmers' environmental empowerment on the relationship between agro-processing smes' environmental standards and poverty eradication

Different scholars advance different definitions for environmental empowerment. According to Cole (1992), environmental empowerment is a process that enables individuals to participate effectively in collective efforts to solve common problems. Environmental empowerment also refers to processes through which individuals and collectives gain voice and control in the face of environmental threats (see Rousset et al., 2015). Farmer empowerment is widely regarded as the most sustainable approach to helping poor farmers in Africa move out of poverty (Beaudoux et al., 1995). The majority of research on farmers' empowerment in developing nations focuses more on the economic empowerment of farmers, more specifically women, rather than environmental empowerment (United Nations, 2018). Empowerment in agriculture refers to the ability of individuals to take control of their lives (Bartlett, 2008).

The economic and environmental empowerment of farmers are both important factors in reducing poverty. Despite the scarcity of studies on environmental empowerment, farmers in developing nations, including Uganda, have been trained in environmentally friendly practices and the use of environmentally friendly technologies (United Nations, 2014). For example, training has been conducted in using environmental technologies that include greenhouses, solar energy and water harvesting, and traditional farming methods such as intercropping (Thrupp, 2000). With such training, farmers are equipped with the technical skills required for engaging in environmentally friendly agricultural practices (Muralidhara and Faheem, 2014) and the adoption of bio-diverse agricultural innovations (Thrupp, 2000). Although farmers may be empowered through training and the provision of environmentally friendly technologies, what empowers one farmer may not empower another (Hamidizadeh et al., 2012; Yang and Ok Choi, 2009). In addition, lack of readiness, desire and know-how on part of the farmers may affect the implementation of environmentally friendly agricultural initiatives (Ghosh, 2013; Raineri et al., 2016).

Empowering farmers results in reduced poverty through an increase in productivity, reduced labour intensity demand and risks of climate change (Thiessen, 2016; Maher et al., 2015). Also, farmers' empowerment contributes to a reduction in poverty levels and higher public food safety standards enforced through legislation; firm level standards also have a role to play (Hammoudi et al., 2009). Stringent public food safety standards and firm level standards drive farmers into adopting environmentally friendly practices that increase their prof-

its; however, this is at the expense of agro-processing firms (Yu and Bouamra-Mechemache, 2016). The presence of standards and farmers's empowerment results in better economic performance, therefore reducing the level of poverty among farmers. It can therefore be hypothesised that:

H3: Farmers' environmental empowerment moderates the relationship between environmental standards and poverty eradication.

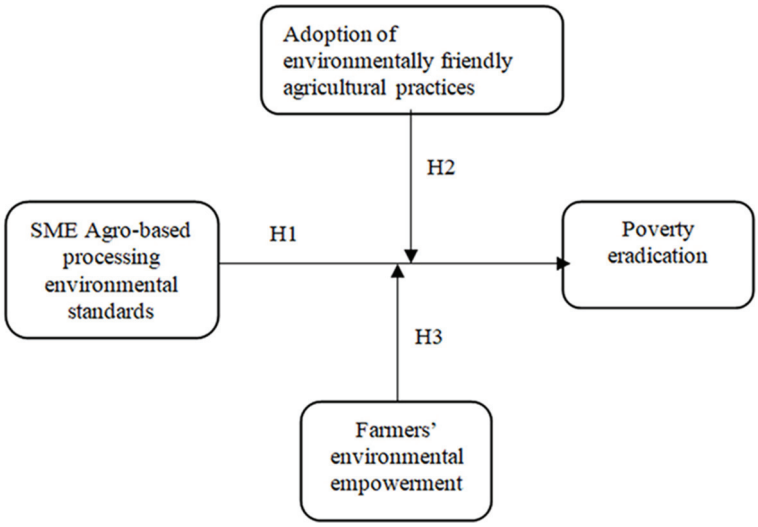

FIGURE 1 **Conceptual Framework**

Source: Green Supply Chain Management, Agricultural Supply Chains and Sustainable Agriculture Literature Review

METHOD

This section provides a discussion on the method that was employed. It looks at the research design, study population and sampling, unit of inquiry, data sources and collection methods, data analysis and ethical considerations.

Research design

As the study was undertaken at one point in time, it adopted a cross-sectional research design. The study also involved testing the hypotheses. Therefore, a quantitative approach was more relevant in providing responses to the set research hypotheses.

Population of the study, sampling and sample size

The population of the study was agro-based processing firms. Only agro-based processing SMEs registered by the Uganda Manufacturing association were used. These are firms that

are certified by the Uganda National Bureau of Standards. A total of 200 agro-based food processing firms were used from a total of 5,966 agro-based processing firms. The sample of ago-based processing firms from which the data were collected was determined using Roscoe's (1975) rule of thumb, that the sample should be ten times or more greater than the number of variables being studied (Logaa and Zailani, 2013; Mohan and Zailani, 2011). Using this rule, and because the study consisted of four study variables, a sample of 40 (4 variables multiplied by 10) purchasing managers was required; however, a sample of 300 was sought. Purchasing managers are in charge of acquiring items for the agro-based processing firms: they identify and award contracts to suppliers. Using the rand () function in Excel, the list of the agro-based manufacturing firms was entered and random numbers assigned. The firms were later arranged in ascending order whereafter the first 300 firms were considered. A total of 200 responses were obtained on collecting the data from the field, a response rate of 67%.

Data collection and instrument

Data were collected via a hardcopy survey questionnaire. Responses were plotted on a 7-point Likert scale in line with similar studies. Measurement items used for environmental standards were from Delmas and Pekovic (2013), the adoption of environmentally friendly agricultural practices from Tey (2013), environmental empowerment from Namagembe (2017), and poverty eradication from Bashir (2010). The three control variables were selected based on previous studies indicating that engagement in agricultural practices is sensitive to age, education and gender (Kerdsriserm et al., 2016).

Data analysis

Data were entered in SPSS software and checked through tests for multicollinearity and common method variance. Convergent validity and discriminant validity results were obtained using SMART PLS software, and factor analysis and normality results using CB-SEM Software. The data were normally distributed with skewness values less than 2 and kurtosis values less than 7 for all variables. Previous research on normality suggests that the absolute value of univariate skewness should be <2 while the absolute value for univariate kurtosis should be <7 (Curran et al., 1996). Skewness values for all variables were less than 2 with a range from $-.018$ to $-.340$, while kurtosis values for all variables were less than 7 with a range from $-.552$ to 1.953.

Harman's single factor was used to test for Common Method Variance (CMV) and all factors were well below the 50% recommended for validating the data (Hazen et al., 2011). Similarly, there were no multicollinearity issues because the Variance Inflation Factors (VIF) were less than 10.0 and the tolerance factors above 0.10. The tolerance values ranged from 0.460 to 0.685, while the VIF factors ranged from 1.460 to 2.174. Convergent validity was measured using average variance extracted (AVE). AVE values were above 0.40 (Xu and Fox, 2014; Zaheer et al., 2010). Discriminant validity was confirmed because all item crossing loadings of the respective constructs with other constructs were higher on their respective

constructs compared to other constructs. Reliability values were above 0.70 as recommended (Nunnally and Bernstein, 1978) (agro-based processing SME environmental standards =0.83; Farmers' Adoption of agricultural environmentally friendly practices = 0.85; Poverty eradication = 0.90; Farmers environmental empowerment = 0.79).

Factor analysis

Except for poverty eradication and farmers' environmental empowerment, environmental standards and adoption of environmentally friendly practices had loadings below 0.30. Items 4 (In my firm, internal and external environmental audits are carried out to gauge the environmental performance of our firm) and 5 (Employees in my firm are trained in environmental issues) for environmental standards, and item 1 (Suppliers of agricultural raw materials to my firm use intercropping practices) for the adoption of environmental management practices, had loadings below 0.30. However, the items were retained because they had critical ratios above 1.96 and P-Values that were significant (see Table 1 below).

TABLE 1 **Factor Loadings for the Measurement Items**

Environmental Standards	*Item loading*	*Critical ratios*	*P-values*
My firm implemented environmental policies	0.93	4.194	P≤0.0001
My firm makes use of internal environmental assessment tools such as benchmarking and accounting procedures	0.88	4.176	P≤0.0001
My firm established environmental performance goals that are supposed to be achieved	0.79	4.117	P≤0.0001
In my firm, internal and external environmental audits are carried out to gauge the environmental performance of our firm.	0.28	2.881	P≤0.01
Employees in my firm are trained in environmental issues	0.21	2.435	P≤0.01
In my firm, employees are given incentives based on our firm's environmental performance	0.32	3.110	P≤0.01
My firm adopted international quality management and environmental standards such as ISO 9000, BS 7750, ISO 14000	0.30	3.828	P≤0.0001
The adoption of agricultural environmentally friendly practices			
Suppliers of agricultural raw materials to my firm use intercropping practice	0.27	3.508	P ≤0.0001
Suppliers of agricultural raw materials to my firm grow pest resistant crop varieties	0.30	3.952	P≤0.0001

TABLE 1 **Factor Loadings for the Measurement Items *(Cont.)***

Environmental Standards	*Item loading*	*Critical ratios*	*P-values*
Suppliers of agricultural raw materials to my firm reduced tilling of their farms	0.77	9.609	P≤0.0001
Suppliers of agricultural raw materials to my firm get rid of weeds by cultivating their plants	0.78	9.700	P≤0.0001
Suppliers of agricultural raw materials to my firm scout their crops for pests	0.78	9.703	P≤0.0001
Suppliers of agricultural raw materials to my firm have increased farm sales	0.51	6.527	P≤0.0001
Suppliers of agricultural raw materials to my firm use legume rotation as a method of crop farming	0.71	3.529	P≤0.0001
Farmers' environmental empowerment			
I believe farmers are given freedom and independence to decide on their own on how to go about doing their work.	0.70	10.695	P≤0.0001
I believe farmers have access to all vital environmental information.	0.77	13.474	P≤0.0001
I believe farmers perform environmental management jobs that allow them to make and instigate changes in the way they perform their environmental management work tasks.	0.90	17.592	P≤0.0001
I believe farmers are permitted to act and think without interference on environmental management issues.	0.54	8.155	P≤0.0001
I believe farmers are given freedom to communicate environmental issues without interference.	0.90	3.295	P≤0.0001
Poverty eradication			
Since I adopted the use of agricultural environmentally friendly practices, my income level has increased	0.42	4.498	P≤0.0001
As a result of adopting the use of agricultural environmentally friendly practices, I am assured of enough food to feed my family for the next one month	0.63	5.582	P≤0.0001
Adopting the use of agricultural environmentally friendly practices has made beneficiaries produce enough agricultural products to serve the market	0.75	5.951	P≤0.0001

TABLE 1 **Factor Loadings for the Measurement Items *(Cont.)***

Environmental Standards	*Item loading*	*Critical ratios*	*P-values*
As a result of adopting the use of agricultural environmentally friendly practices, I can afford good health facilities for my family	0.55	5.265	P≤0.0001
As a result of adopting the use of agricultural environmentally friendly practices, my accommodation facilities have improved	0.88	6.251	P≤0.0001
Adopting the use of agricultural environmentally friendly practices has enabled me to pay my usual bills (telephone, water, transportation and electricity bills)	0.93	6.330	P≤0.0001
I live above the poverty line (2300/= per day) because I adopted the use of agricultural environmentally friendly practices	0.87	6.220	P≤0.0001
Adopting the use of agricultural environmentally friendly practices has enabled me to improve the education facilities of my children	0.42	4.511	P≤0.0001
Generally, since I adopted the use of agricultural environmentally friendly practices, my standard of living has improved	0.43	1.641	P≤0.0001

Source: Devised by author

FINDINGS

This section provides research findings for the three research hypotheses: the influence of environmental standards of agro-processing firms on poverty eradication, and the moderating role of farmers' environmental empowerment and practice adoption on the environmental standards-poverty eradication relationship.

Research findings indicate that environmental standards have a positive influence on poverty eradication. From the results, the increased application of environmental standards increases poverty eradication. A detailed analysis of the results shows that many of the farmers experienced an increment in farm sales; this implies a reduction in the levels of poverty as a result of pressure from agro-processing firms (see Table 2). For example, over 60% had an improvement in the standard of living and levels of income. In addition, farmers engaged in environmentally friendly practices without interference were free to make changes in their work related to environmental issues and had access to environmental information.

Moderation results indicated the existence of a partial moderation. Both farmers' adoption of environmentally friendly practices and their environmental empowerment moderated the relationship between environmental standards and poverty eradication (see Tables 2 and 3).

TABLE 2 **The Moderating Role of Farmers' Adoption of Environmentally Friendly Practices on the Relationship between Environmental Standards and Poverty Eradication**

	Model 1	*Std error*	*Model 2*	*Std error*	*Model 3*	*Std error*	*Collinearity Tolerance*	*Statistics VIF*
Constant (poverty eradication)	1.037*	0.406	0.129**	0.467	0.225**	0.457	Na	Na
Environmental standards	0.59**	0.070	0.387**	0.094	0.362*	0.092	0.509	1.966
Adoption of environmentally friendly agricultural practices			0.289**	0.112	0.283**	0.110	0.510	1.959
Environmental standards *adoption of environmentally friendly agricultural practices					0.179*	0.064	0.962	1.039
R	0.586[b]		0.621[c]		0.645[d]		Na	Na
R square	0.343		0.386		0.417		Na	Na
Adjusted R square	0.330		0.370		0.417		Na	Na
F-statistics	24.835		23.759		22.378		Na	Na
Sig	0.0001		0.0001		0.0001		Na	Na
R-square change	0.334		0.043		0.031		Na	Na
F-change statistics	96.513		13.118		9.886		Na	Na
Sig F change	0.0001		0.0001		0.02		Na	Na

Note: n=200,
**regression is significant at 0.0001 level,
*regression is significant at the 0.05 level,
standardised coefficients are reported.

Source: Devised by author

The direct effect of environmental standards on poverty eradication was slightly higher than the interactive effect.

A partial moderation was obtained for the interactive effect of the adoption of agricultural environmentally friendly practices by farmers and environmental standards because some farmers incurred higher costs when implementing these practices (Lambrecht et al., 2016). For example, some farmers saw it was costly to adopt green rather than other agricultural practices. In addition, environmentally friendly agricultural practices required a change of mind-set for adoption to take place (Hobbs, 2007; Wall, 2007). For some farmers, the adoption of environmentally friendly practices facilitated access to lucrative markets and supply chains; however, for others unable to meet the requirements, the adoption of environmentally friendly practices restrained market access (Rousset et al., 2015). Therefore, the levels of adoption for the practices are still low in developing countries such as Uganda

TABLE 3 **The Moderating Role of Farmers' Environmental Empowerment on the Relationship between Environmental Standards and Poverty Eradication**

	Model 1	*Std error*	*Model 2*	*Std error*	*Model 3*	*Std error*	*Collinearity Tolerance*	*Statistics VIF*
Constant (poverty eradication)	1.037**	0.352	0.434*	0.148	0.405*	0.144	Na	Na
Environmental standards	0.585**	0.070	0.085*	0.030	0.092**	0.030	0.678	1.475
Environmental empowerment of farmers			0.904**	0.004	0.896**	0.004	0.694	1.442
Environmental standards* Environmental empowerment of farmers					0.071*	0.025	0.971	1.030
R	0.586[b]		0.956[c]		0.959[d]		Na	Na
R square	0.343		0.914		0.919		Na	Na
Adjusted R square	0.330		0.912		0.917		Na	Na
F-statistics	24.835		403.690		356.553		Na	Na
Sig	0.0001		0.0001		0.0001		Na	Na
R-square change	0.334		0.571		0.005		Na	Na
F-change statistics	96.513		1260.558		11.263		Na	Na
Sig F change	0.0001		0.0001		0.001		Na	Na

Note: n=200,
**regression is significant at 0.0001 level,
*regression is significant at the 0.001 level,
standardised coefficients are reported.

Source: Devised by author

(Teklewold et al., 2013), and farmers' environmental levels for environmental protection are still far below target environmental levels set by the government. This implies that there is still a need for farmers to further shift their farming methods to the targeted level. Agro-based processing SMEs in Uganda use environmental standards as a tool to get farmers engaged in environmentally friendly agricultural practices.

In Uganda, many of the farmers use the weed cultivation method followed by growing pest resistant crops, crop scouting, intercropping, reduced land tillage and lastly legume crop rotation (Nieuwenhuis and Nieuwelink, 2005; Ssali, 2016). For example, groundnut growers scout them on a regular basis; weed cultivation is mainly carried out by the women and land tillage by the men. There is less use of pest resistant crops because farmers still lose millions of dollars annually due to pests such as Sweet potato weevil and virus infestation, Cassava Brown Streak Disease, and Cassava Mosaic and Banana Bacterial Wilt Disease

(Ssali, 2018). In addition, some pests, such as blight disease, have been found to be resistant to herbicides. When tilling the land, they use oxen, which is environmentally friendly (see Muzaale, 2013). Fertiliser use is at an average of 1kg of nutrients per hectare, far below the recommended standard of 200kg made by the Abuja declaration of 2006. All cultivation methods contribute to a reduction in the farmers' expenditure in one way or another and reduce environmental degradation. Environmental degradation results in predominant poverty, as it reduces the availability of productive soils (Kulindwa et al., 2010).

A partial moderation effect of farmers' environmental empowerment on the environmental standards-poverty eradication relationship was obtained. However, the sole effect of farmers' environmental empowerment on poverty eradication was higher, even with the presence of environmental standards. Unlike the developed world, farmers' environmental empowerment is emphasised less compared to economic empowerment in developing countries. Although farmers contribute to environmental degradation and are at the same time affected by climate change, the participation of farmers in decisions and policy debates surrounding climate change and other environmental issues is limited in developing countries like Uganda; this is the reason for the low interactive effect. Greater levels of farmers' participation results in correspondingly higher levels of empowerment; this is through the increasing involvement of disempowered farmers whose activities have a negative impact on the environment (Zimmerman and Rappaport, 1988). Farmers can be empowered through working on environmental issues that affect their well-being. However, many developing countries are characterised by formal environmental disempowerment where citizens' voices may be allowed in public meetings but with no real citizen power in the decision-making process (Van Voorhees, 2012). The empowerment of farmers in developing countries like Uganda is done through social networks and training from donor agencies (Vasilaky, 2016; Thuo et al., 2014).

CONCLUSIONS

This study aimed to examine the influence of environmental standards set by agro-processing firms on poverty eradication, the moderating role of farmers' adoption of environmentally friendly practices, and farmers' environmental empowerment on the environmental standards-poverty eradication relationship. Results showed that environmental standards positively influenced poverty eradication. A partial moderation effect of farmers' adoption of environmentally friendly practices and farmers' environmental empowerment on the environmental standards-poverty eradication relationship was found: however, the moderation effect was low for both variables. A low moderation effect for farmers' environmental empowerment signifies the existence of formal environmental disempowerment where, in many developing countries, the voice of citizens is only allowed in public meetings but with no real power in the decision-making process. For the case of the moderation effect of environmentally friendly agricultural practices, many farmers attach a cost implication on the adoption of environmental practices. This limits their engagement in environmentally friendly agricultural practices even when pressure is placed on them.

The research contributes to the supply chain literature and the agricultural industry; it also informs policy. For policy-makers, governments could use private standards as a cost-effective instrument for promoting sustainable development in agriculture, reducing the negative impacts of farming, making more efficient use of natural resources and delivering public goods to the society. There is also a need for the involvement of farmers in decisions and policy debates surrounding climate change and other environmental issues. This may be done through strengthening co-operatives and farmer groups in developing countries. The participation of farmers increases visibility on the effect of their farming practices on the environment and what can be done to reduce the environmental burden and poverty levels. In addition, more funds need to be allocated to promote environmental empowerment of farmers as the current allocation is not sufficient. Likewise, improved international and industrial-country trade policies can promote agricultural technology sharing, which enhances a reduction in environmental emissions and investment costs.

Regarding theory, the study contributes through examining the impact of environmental standards on poverty eradication, and the moderating role of environmental empowerment and practice adoption on the relationship between agro-based processing SMEs' environmental standards and poverty eradication among small scale farmers. These aspects have been ignored in the agriculture, supply chain and environmental management literature.

Farmers need to take the initiative to participate in decisions and policy debates surrounding climate change and other environmental issues. They need to enrol on training programmes on the use of environmentally friendly agricultural technologies and seek out existing programmes that promote engagement in environmentally friendly agriculture.

The limitations of the research include the research focusing on only small scale agricultural farmers; similar research on livestock farmers is required to access the impact of environmental standards of agro-processing firms on poverty eradication. Given the limited research on the influence of agro-based processing SMEs' environmental standards and farmers' environmental empowerment in the agricultural sector, a comparative study should be carried out to discover whether there is a similar behaviour in the variables across nations.

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