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Mercy Mburu, Dr. Joseph K. Muriithi & Dr. Jane Mutinda

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Contribution of Sustainable Land Management Practices in Snow Peas Farming to Production Costs in Gathara Ward

[1*]Mercy Mburu, [2]Dr. Joseph K. Muriithi & [3]Dr. Jane Mutinda

[1]Postgraduate Student, School of Environmental Studies
Kenyatta University
[2]Lecturer, School of Environmental Studies
Kenyatta University

[3]Lecturer, School of Environmental Studies
Kenyatta University
***Corresponding email: mesi88@rocketmail.com**

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Abstract

The research study focuses on evolution of consumer demands which led to development of certification schemes that begun with development of Europe's Protocol for Good Agricultural Practice, EUREPGAP which later on changed to Global Protocol for Good Agricultural Practice. This was after the realization of unsustainable production practices that resulted in environmental degradation and did not uphold human dignity. As such, Kenya went ahead and localized the certification scheme which was guided by Strategy to Revitalize the Agricultural Sector that aimed at ensuring sustainable production systems. Among the standards include, the sustainable land management practices which have been known to be environmental friendly as well as result in job creation. The study focuses on snow peas production which is among the affected horticultural produce. It targets smallholder producers in North Kinangop Ward who have had difficulties of complying with the standards due to the cost implications. More specifically it will: Determine contribution of sustainable land management practices in snow peas farming to production costs in North Kinangop Ward; Assess environmental implications of integrating sustainable land management practices in snow peas farming in North Kinangop Ward and; Examine the market opportunities for integrating sustainable land management practices in snow peas farming in North Kinangop Ward. The study therefore revealed some of the benefits realized

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upon adoption of sustainable land management practices by use of both qualitative and quantitative data. The data was collected using questionnaires and key informant interviews. The quantitative data were appropriately be coded and then cleaned using Census and Survey Processing System (CSpro) a computer programme and later on exported to Statistical Package for Social Sciences for analysis. Percentages, means and regression analysis shall be used in generating results for all the objectives. For qualitative data, themes shall be developed and data categorized as per the themes, then using inferential deduction conclusions shall be drawn to build up on the results from SPSS analysis. The multivariate logistic regression revealed that certification schemes were negatively and significantly associated with cost of production. In addition, the study found out that certification requirement practices and cost of production are negatively and significantly related Irrigation frequency and cost of production are negatively and significantly related. Method to control pests and diseases and cost of production are negatively and significantly related. Further, the finding of the study demonstrated that source of capital and cost of production is negatively and significantly relate.

Keywords: *Snow peas, farming, production costs, Gathara Ward*

1.1 Introduction

Snap bean, also known as snow pea is a nutritious leguminous vegetable widely cultivated all over the world. It is considered an important foreign exchange earner being an export vegetable highly demanded in the European Union (EU) and the United States of America (USA) markets. In Kenya, snow pea farming is mostly grown under smallholder system who account for 60% of the total production.

Recently, there has been emphasis on sustainable agriculture production all over the world attributed to shift in consumer habits. They demand healthy sustainably produced food safe for consumption (Hammoudi *et al*., 2009) and are willing to pay for the same (Hope, 2012). This led to emergence of post-productivist transition emphasizing on the whole food chain incorporating environmental regulation in the agriculture sector (Mithöfer & Waibel, 2011) leading to emergence of sustainable land management practices. They aim at utilizing techniques and technologies that maintain and increase farm productivity and profitability while ensuring provision of food on sustainable basis through pollution reduction and sustainable resource utilization (Zoss & Pletziger, 2007).

For European Union in particular, there have been particular concerns on horticultural production (Stephan, 2008). In United Kingdom alone, production stage amounts to 83% of an average household carbon dioxide emissions at 8.1tonnes annually (Hammoudi *et al*., 2009). Tthis resulted in formulation of legislations and directives that underpin the importance of sustainable agriculture. Further, World Trade Organization introduced agreements on sanitary and phyto-sanitary measures aimed at ensuring food safety, protection of workers and the environment. This resulted in standardization of food safety regulation all over the world (Asfaw *et al*., 2010a) and introduction of voluntary certification measures including Global Protocol for Good Agricultural Practice (Global GAP) globally and Kenya Protocol for Good Agricultural Practice (Kenya GAP) nationally.

1.2 Problem Statement

Studies by (Narrod *et al.,* 2009) indicate that adoption of sustainable land management practices could result in increased productivity at reduced cost, and enhance market access at better prices. Has potential to enhance water use efficiency by 35% and reduce deforestation by 55% transforming agriculture from an emitter to a Green House Gas (GHG) sink.

Considering snow peas production in the tropics is labor intensive, utilize scarce water resources unsustainable ((Food and Agriculture Organization *et al.,* 1997) as well as intensive weed and pest control, then such practices are crucial. The indiscriminate application of agro-chemicals is evidenced by pesticide poisoning of over 40,000 human deaths; annually, (Kleinwechter and Grethe, 2006). Consequently, the sub-sector is marred with environmental degradation (Suzuki *et al*., 2011) thus reduced income. This study therefore seeks to examine how application of sustainable land management has contributed to conservation of local ecosystems by examining its influence on production costs.

1.3 Study Objective

To determine contribution of sustainable land management practices in snow peas farming to production costs in Gathara Ward.

2.0 Literature Review

2.1. Theoretical Background on Global Protocol for Good Agricultural Practice

In early 1990s, food safety and environmental concerns began to rise in Europe resulting in private voluntary safety standards following consumer growing concern on the whole food chain and its environmental impacts. This led to the formation of the initial EUREGAP standards which were critical in assisting producers to comply with the Europe wide standards for sustainable production, food safety, worker and animal welfare and responsible use of water, feed and plant propagation materials (Global GAP, 2015). The certification has since gained global significance and as a result, EUREP GAP was converted to Global GAP in 2007. Currently, the Global GAP is the world's leading farm assurance program embraced by over 100 countries.

Global GAP standards were developed to ensure that environmental and social sustainability standards were maintained throughout the world. Global GAP embodies good agricultural practice and good manufacturing practice by ensuring that exporters of agricultural produce adhere to integrated crop management, integrated pest control, quality management, hazard analysis, worker health, safety and welfare as well as adherence to environmental protection and conservation (Global GAP, 2015).

The certification is obtained individually or as a group. For a farmer to be certified, they are required to adhere to the set standard requirements (Henson *et al*., 2011). It is divided into five main categories namely: fruits and vegetables, flowers and ornamentals, combinable crops, green tea and green coffee. Snow peas to be specific, falls under Global GAP Fruit and Vegetables Standard. This standard covers all stages of production to post harvest produce handling (Humphrey, 2006). Accordingly activities such as soil management, plant protection, produce handling; packaging and storage are all catered for by this standard.

2.2 Global Context of Global GAP Certification and Its Effect on Horticultural Production

Global GAP certification has had different impacts developing and developed countries. According to Luvai (2008), such standards are only reasonable to farmers in the developed nations and large scale producers in developing nations who have the resources and capacity to comply. Despite this, Luvai (2008) notes that, agriculture production is largely controlled by smallholder farmers who in Kenya account for 60% production but lack capacity to comply. According to Asfaw, *et al.*, (2009), developing countries are faced with high costs of compliance, inadequate technical capacity as well as unfavorable operational environment.

According to Mithöfer & Waibel, (2011), the production of horticulture in developing countries is mainly constrained by lack of information. Taking a three angle approach (consumer, producer and policy) perspective, producers were discovered to be unaware of consumer preferences and regulatory standards. Consumers on the other hand were found to suffer from misinformation and perception; their preferences were heavily influenced even with outdated reports. Finally, policies to enhance standardization rarely were effective due to weak institutions; for enforcement and training purposes (Henson *et al*., 2011).

Certification compliance has both benefits and costs. The benefits can be financial or non-financial. The non-financial benefits include capacity building and training for farmers, easier access to credit, increased market access and accessibility to new varieties which are more yielding and more resistant to pest and diseases. The practice has been attributed with yield increase. According to (Henson and Humphrey, 2009) a study in Tanzania on smallholder baby corn and green pea revealed increase in productivity of certified by 16% while their counter parts managed 10% increase. For snow peas, the yields were higher by almost 32%. In terms of prices, the uncertified beans and snow peas were discovered to be 1.8% lower than the prices for certified produce. Accordingly, this culminated in the rise of net revenues for baby com and green peas for certified smallholder farmers by 10% and 24% respectively.

2.3 Experiences of Certification and Horticulture Production in Africa

As at 2004, the percentage of certified producers in world was composed of 66% of farmers from Europe. The growing importance of Global GAP certification has seen the compliance increase in spread to other continents where virtually all countries in North and South America has certified growers. But certification practices in Africa have been scarce; certified growers mainly come from Eastern Coast of Africa, Kenya to be specific. In Asia, the certification practice has mainly been adopted by South East Asian countries, for example, Guatemala (Mithöfer & Waibel, 2011).

2.4 Kenyan Certification Experience and its Implication on Horticultural Production

The Kenyan experience has seen adoption of a public mandatory standard and a private voluntary standard with KS-1758 Code of practice for the horticulture industry being one of them. It is a practice for the horticulture industry was developed in the year 2002 by technical bench of National Food Safety Committee in conjunction with KEBS. The code of practice was a culmination of code of practice Kenya Flower Council 1998 and FPEAK code of practice 1996 (Okello, 2005).

The main challenge regarding this policy as indicated by various literatures was the formulation stage, it is acknowledged that small holder farmers had minimal contact with the committee hence their contribution to the policy was scarce (Humphrey, 2008). Farmer representation was thought to be expressed through FPEAK which is mainly made up of large scale and medium scale farmers and exporters. The purpose of this code of practice was to provide a guideline for GAPs, worker health and safety and environmental concerns. Another challenge that was experienced with this code was lack of information by small scale farmers on its existence and implications. A study done by (Humphrey, 2008) indicates that 70% of small scale famers are unaware of its existence. The huge financial implications of attaining its certification as well as accruing for audit fees were largely prohibitive for small scale farmers (Chemnitz *et al.,* 2007).

2.5 Kenya Protocol for Good Agricultural Practice

On the premise of a growing international regulatory environment and voluntary requirements for products as well as the significance of horticultural produce to the Kenyan economy, a consortium of public and private organizations in Kenya decided to develop their own voluntary standard benchmarked on Global GAP. In 2007, Kenya GAP was therefore launched to cater for fruits, vegetables and flowers.

The Kenyan Ministry of Agriculture, Kenya Plant Health Inspectorate Service (KEPHIS) and the Kenya Bureau of Standards (KEBS) were the government departments that took part in the formulation process. From the private sector, the FPEAK- Fresh Produce Exporters Association of Kenya was the main player. Collectively, the government was to provide technical expertise, information and nominal support. Accordingly, the government mobilized several actors and stakeholders and set up the National Task Force for Horticulture. This task force effectively replaced the national Maximum Residue Level (MRL) Steering Committee whose focus was to manage plant protection products (PPP) residue limits in line with export requirements (Asfaw *et al*., 2010b).

2.5.1 Snow peas certification and Kenyan experience

Snow peas and French beans account significantly for the country's horticulture export. As of 2011, they accounted for 7.5% of the exported value of horticultural earnings. For vegetable exports, snow peas are the second most valuable crop after French beans based on the tonnage. Trade of high value snow peas to the EU has provided for lucrative market to small scale significantly changing the rural economic development. This is significant considering that 80% of snow peas exports from Kenya are contributed by small holder farmers (Chemnitz *et al.*, 2007). Kenya was also the leading exporter of snow peas and French beans to the EU as of 2011.

Despite the impressive records, snow pea has faced serious challenges owing to non compliance in food safety and quality standards. These include the interception of produce in the international market, regular revision of MRLs and new conformity of pesticides (Okello, 2005). Kenya faced an imposed 10% sampling restrictions for French beans and snow peas owing to what was termed as insufficient guarantees on maximum residue levels from Kenya's official control systems (Henson *et al*., 2011). This resulted in increased cost of compliance given the cost of sampling in Kenya was Ksh. 21,000 per sample and shortage in supply owing to uncertainties in the market resulting in reduced production. Further, non

compliance led to suspension of export licenses until due diligence was confirmed. Finally, small holder farmers who account for 80% of production were shunned by exporters for fear of non compliance thus loss of livelihoods and slump in sales by over 25% (Asfaw *et al*., 2009).

3.0 Research Methodology

The study was conducted in Gathara Ward which is one of the snow peas producing zones in Nyandarua County. The study used mixed research design where qualitative, quantitative and experimental research methods shall be used. To obtain data for analysis, the samples for the research were selected from Engineer Production Zone. Multilayered sampling was used where groups were first selected proportionately so as to ensure selection of groups involved in snow peas production. Purposive sampling was employed to select respondents for the key informant interviews so as to be able to select respondents who have in one way or another have experience in certification in snow peas production and marketing.

A representative sample of 400 farmers was the respondents for the standardized questionnaire as arrived at using the Yamane formula (1987). Both qualitative and quantitative data were collected using questionnaires and interview guides which shall be pretested for reliability and validity. Key informants include HCDA, FPEAK, KEPHIS, Ministry of Agriculture and Global GAP secretariat representative. Graphs and tables shall were generated using means and percentages to get results for the objectives while counter factual shall be used to get implications of certification and adoption of sustainable land management practices by snow peas farmers as per the study objectives. Linear regression analysis was used for analysis of interrelationships between the independent and dependent variables. For qualitative data, key thematic areas based on context and relevance shall be identified to guide in categorizing the data appropriately based on the research objectives.

4.0 Analysis, Results and Discussions

4.1 Response Rate

The number of questionnaires that were administered to Gathara Ward residents was 350. A total of 350 questionnaires were properly filled and returned. This represented an overall successful response rate of 87.5% as shown on Table 1. According to Mugenda and Mugenda (2003) and also Kothari (2004) a response rate of above 50% is adequate for a descriptive study. Babbie (2004) also asserted that return rates of above 50% are acceptable to analyze and publish, 60% is good and above 70% is very good. Based on these assertions from renowned scholars, 87.5% response rate is very good for the study. Thus the response rate of 87.5% under this study was very good for study.

Table 1: Response Rate

Response	**Frequency**	**Percent**
Returned	350	87.5%
Unreturned	50	12.5%
Total	**400**	**100%**

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4.2 Influence of Sustainable Land Management Practices in Snow Peas Farming on Production Costs

The objective of the study was to determine contribution of sustainable land management practices in snow peas farming to production costs in Gathara Ward. A multivariate logistic regression was used to model relationship between sustainable land management practices in snow peas farming and production costs. Table 1 showed that certification schemes was negatively and significantly associated with cost of production (Exp (B)= -1.1049, P=0.006).

Table 1: Sustainable land management practices in snow peas farming and production costs

Cost of Production	Coef.	Std.Err	z	P>|z|
certification schemes	-1.048965	0.57572	-1.82	0.006
Certification requirement practice	-4.551182	0.849104	-5.36	0.000
Training adequacy	-0.060784	0.421163	-0.14	0.885
water irrigation source	-0.003964	0.325377	-0.01	0.99
Embraced soil management	-0.024509	0.096395	-0.25	0.799
irrigation frequency per week	-0.441337	0.171858	-2.57	0.001
time of irrigation	-0.540607	0.417187	-1.3	0.195
method to control pests and diseases	-3.561172	0.749304	-4.57	0.001
Source of capital	-0.438945	0.269775	-1.63	0.010
_cons	-5.396422	1.574941	-3.43	0.001

No. of observations=	350
LR chi(8)=	75.97
Prob>chi2=	0.0000
Pseudo R2=	0.6724
log likelihood=	-101.46

Thus, the cost of production for those who are members of certification scheme is 1.049 times lower than those who are not certified. In addition, the results revealed that certification requirement practices and cost of production are negatively and significantly related (Exp (B)= -4.5511, P=0.000).Thus the cost of production incurred by those who practice cerfication requirements are 4.5511 times lower than those who do not practice certification requirements. The logistic regression model also revealed that irrigation frequency and cost of production are negatively and significantly related(Exp (B)= -0.4413, P=0.001).This means that the cost of production for those who do irrigation more frequently is 0.4413 times lower than those who rarely irrigate their snow peas farms. Method to control pests and diseases and cost of production are negatively and significantly related (Exp (B)= -3.5611, P=0.001). This means that the cost of production for those who have best methods to control

pests and diseases is 3.5611 times lower than those who do not have the best control methods. Lastly, the results indicated that source of capital and cost of production are negatively and significantly related(Exp (B)= -0.4389, P=0.010).Thus the cost of production for those who access better sources of capital is 0.4389 times lower than those who do not access. The R^2 of the logistic model was 67.24%. This means that the variables explained the cost of production satisfactorily. The overall model was significant since the p value 0.0000 which is less than the critical p value (0.05).

5.0 Conclusions

Based on the findings above, the study concluded that certification plays a great role in production costs reduction and increased production of snow peas.

6.0 Recommendations

Based on the findings and conclusions above, the study recommended that the government need to support the small scale horticultural production systems through flexing the requirements/policies required for certification.

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Administrative Map of Nyandarua County Wards