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The Influence of Standards Compliance in Input Use on the Internationalisation of Kenyan Horticulture

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Abstract:

Input use during horticulture farming has a direct impact on safety and quality of crops and it is still difficult for farmers to respect the established standards in this respect. This situation undermines the competitiveness of exports for the Kenyan horticulture produce. Among the factors that justify why farmers are not meeting the standards related to input use in horticulture farming, there are: difficulties in getting appropriate seeds, fertilisers and chemicals, lack of required skills and inadequate trained manpower; insufficient quantity of water and its continual declining quality. This paper sought to investigate the influence of Standards Compliance in input use on the Internationalisation of Kenyan Horticulture; by discussing various challenges related to availability and affordability of recommended seeds, fertilisers and pesticides, and management of water in the Kenyan horticulture Sector.

This paper was guided by a positivism research philosophy and a descriptive and explanatory research design was applied to achieve its purpose. The population of the study was the total number of ordinary members of the Fresh Produce Exporters Association of Kenya (FPEAK). The target population was 161 Fresh Produce Exporters, corresponding to the total number of FPEAK registered ordinary members by March 2017. Yamane's (1967) formula was used to calculate the sample size of the respondents and therefore, a stratified random sampling of 115 units was selected. A semi-structured questionnaire incorporating input use in horticulture was used to collect information about standards compliance in input use and internationalisation. The analysis was based on 108 respondents who completed and returned the questionnaires, corresponding to the response rate of 94%. The descriptive statistics including percentages and frequencies and the inferential statistics comprising of Pearson Correlation and linear regression model were generated. Qualitative data collected through interviews, focus groups, and open ended questions were processed and analysed following the thematic approach.

This paper finds that recommended seeds are well known and available at the local markets but at a high cost. The seeds produced and certified locally are not of good quality, and seed importers buy more of those with high demand in the local market. Some specific seeds that may contribute to the diversification of Kenyan horticulture produce for export are not available at the local market because the importers are not interested in them as they do not have high demand. Smallholder producers are facing challenge of getting water for their farming due to limited capability of getting boreholes for irrigation. Furthermore, there is lack of knowledge related to rainfall water harvesting technology or treatment of waste and/or poor quality water for irrigation. Finally, the need of water testing is not yet understood. Except for herbs, recommended fertilisers and pesticides for other horticulture produce are known and available at the local market. Due to the high cost of the recommended fertilisers and pesticides, some producers use counterfeit or banned products.

This paper recommends that more research should be conducted in order to develop locally appropriate seeds in horticulture farming; with emphasis on specific crops that would bring a competitive edge. A comprehensive program of seed production in horticulture farming should be established, and training of competent personnel organised accordingly. The Government in conjunction with horticulture producers and exporters need to broaden the horticultural development strategy by diversifying horticultural crops. A systematic risk assessment of soil and water is needed, as well as an extensive research on crops which are less demanding in water. In addition, there is a need to develop and disseminate alternative methods of water management including rainfall water harvesting, treatment of waste water, and encourage efforts in irrigation. Pest Control and Products Board (PCPB) should put in place a controlling mechanism to ensure that subsidies to fertilisers and pesticides lead to the affordability of products, and at the same time, it should set up an efficient monitoring system of illegal and counterfeit products.

Keywords: *Internationalisation, horticulture, standards compliance, input use*

1. Introduction

The growing importance of food quality and food safety standards in international horticulture markets is influencing production and marketing conditions of farmers worldwide. Export oriented developing countries increasingly introduce these standards into their agricultural production systems to secure continuing access to major markets (World Bank, 2005). However, the ability to cope with Sanitary and Phytosanitary (SPS) requirements in industrialised countries is challenging for developing countries (Edewa, 2016). These challenges are driven by the increase of consumer demand for food quality and food safety in developed countries and by the rise of supermarkets in these areas (Muendo & Tschirley, 2004; Reardon et al., 2001). Exporting countries must have the capacity to meet those requirements, both in public and private sector, and undertake necessary conformity checks in order to ensure compliance (Edewa, 2016). The limitations in respecting international standards in horticulture are related to many factors such as: information gap, inadequate or lack of information on the expectation of the requirements by the consumers especially on the expected standards, the lack of professionalism and inadequately trained manpower on food safety and quality, lack of knowledge flow through the supply chain, difficulties in getting appropriate inputs used in farming including seeds, fertilisers and chemicals; insufficient horticulture services, inefficient management of pest and diseases (SAFEACC, 2015).

2. Research Problem

Input use during farming of horticultural crops has a direct impact on safety and quality of the crops (SAFEACC, 2015). However, it is still difficult for farmers to respect the established standards in this respect. On one hand, farmers do not get required input due to high price of seeds, fertilisers and pesticides, poor quality of seeds, poor distribution of farm input stockists, and unavailability of farm input provided by buyers to their contracted farmers, as a result of poor quality of infrastructure (ADF, 2007). On the other hand, even when inputs are available, farmers lack required skills to use them efficiently which might lead to the ban of Kenyan horticulture during export. According to EFSA (2014), the European Food Safety Agency (EFSA) undertook an inspection visit to Kenya in November 2013 to conduct an audit of the Kenyan horticulture industry. This visit was done following a growing concern over the safety of vegetable exports from Kenya. By then, the EU had been closely monitoring the incidence of pesticide residues in peas and French beans imported from Kenya since 2011. These controls revealed higher residue levels in a number of consignments, giving rise to stricter EU controls on peas and beans from January 2013, with 10% of all imports being sampled. In 2014, due to high levels of pesticides and other harmful organisms in their produce, more than 5,000 horticulture farmers and 11 horticulture firms have been banned from exporting fresh produce to the EU market and their licenses withdrawn (Waitathu, 2014).

Water is another valuable agricultural input and availability of water is the biggest challenge that is facing horticultural production in almost all areas of the world (Sharm & Alam, 2013). The provision for adequate water for irrigation is critical to increased production in horticulture, considering that less than 20% of Kenya is arable, and the rest is either arid or semi-arid (ADF, 2007). The production in horticulture has been below optimum and fluctuating mainly due to seasonal rainfall and the vagaries of the weather. The quantity of water available for horticulture activities is insufficient while the quality is continually declining (RSA, 2015). The country's heavy reliance on rain-fed agriculture slows the process of attaining food security and self-sufficiency. This is exacerbated by the fact that the pace of irrigation development in the country is very slow, with only 19% use of the total potential (ADF, 2007). According to the Agricultural Sector Coordination Unit (ASCU) (2012), the main challenges related to water in Kenyan horticulture industry remain to be the low level of water harvesting for irrigation, the low investment in irrigation infrastructures as a result of high costs, the use of unsuitable and poor quality water for irrigation, the lack of good quality water for irrigation in areas with potential for horticulture, the over-exploitation of water resources and continuous degradation of water catchment areas, among others.

It was in this light that the current paper sought to investigate the influence of Standards Compliance in input use on the Internationalisation of Kenyan Horticulture. In this respect, this paper discussed various challenges that producers in the Kenyan horticulture for export are facing related to the availability and affordability of recommended seeds. It has also addressed issues related to the management of water in the Kenyan horticulture industry by looking at the challenges that producers and exporters are facing in getting good quality water and in sufficient quantity to sustain the produce. Finally this paper assessed aspects related to availability and affordability of recommended fertilisers and pesticides, the expertise of producers to use them and the interference of counterfeit or substandard fertilisers and pesticides on the local market.

3. Literature Review

An efficient horticulture seed industry enables farmers to get good quality seeds, in sufficient quantity at an affordable price. It is essential for the promotion of horticulture production because the share of seed cost is relatively high, approximately 12 to 42 percent of the total production cost (USAID, 2007). In their study aiming to assess the factors affecting entrepreneurship in the Indian seed business of horticulture, Kumar & Ali (2010) concluded that quality along with purity of seed is the most important factor in building trust and brand image, which in turn is the most critical element for building and retaining market share. In the Kenya horticulture industry, seed production is well established (USAID, 2012). According to Sikinyi (2010), horticulture seed traded in Kenya comprises of locally produced seed and imported seed. Seeds are also exported from Kenya of which there are either locally produced or re-exports of imported seeds. All imported seed must meet the national quarantine requirements, the minimum Kenyan standards, and must have been tested for adaptability in the

country. Importation of hybrid seed is regulated by KEPHIS to ensure supply is of the correct quality for germination and without contaminants (USAID, 2012). Some producers use inferior seeds from their own harvest or from unsupervised private nurseries due to high cost of imported and certified seeds.

Apart from the concern of seed in horticulture, Warrington (2011) asserts that the issue facing horticulture production all over the world is the availability of water. Pressure on water resources for urban, industrial, recreational, conservation and other uses, all appear to have higher priority than the availability of water for horticulture production. On the aspect of quality of water, Manning & Soon (2013) revealed that produce contamination may also be caused by contaminated water used for washing, hydro-cooling or icing. Furthermore, irrigation water is a potential point of pathogen entry into the food chain as many bacteria and viruses and protozoa of faecal origin can be found in waters which are used in the primary production of food crops. Pathogen can be taken up on plant surfaces especially at the point of harvesting and trimming wounds, damage caused during handling and processing or natural points of entry. Considering the seriousness of the water issue in horticulture, Warrington (2011) recommended urgent researches to resolve issues such as development of drought tolerant crops, the management of crops under the managed water deficits, dealing with increased salinity, and the use of lower quality water. In regard to Kenyan farming activities, the African Development funds (2007) indicates that water remains a major challenge, as agricultural activities are largely dependent on seasonal rainfall, but the amount of rainfall has not been adequate to sustain crop production. Hence, there is a need to minimize dependence on rain-fed agriculture by utilizing water resources for irrigation under sustainable environment management. According to Manning (2008), one of the key drivers of water security is the current and continued ability of water resources to meet the often conflicting needs of domestic supply, amenity uses, and food production including the requirement to irrigate food production areas in order to improve food yields.

Utilisation of fertilisers and pesticides is frequent in horticulture farming of developing countries, and the latter are facing problems in complying with the rules adopted by importing countries limiting the maximum level of pesticides and other residues (MRLs) in fresh fruits and vegetables. They often find it difficult to comply with these requirements, as many of them do not have legislation requiring prior approval of fertilisers and pesticides that are marketed in the country. This results in fertilisers and pesticides that are prohibited from use in importing countries being used in production of crops intended for exports. Farmers are also often influenced in making excessive use of pesticides in order to ensure that exports of fresh fruits and vegetables are not banned by importing countries because of the presence of pest and diseases (ITC, 2004). Legislation in some countries requires that a country wishing to export fresh fruits and vegetables to them must obtain prior approval from the appropriate authorities before it can commence exports. Such approval is granted only if the authorities are satisfied that the fruits are free from diseases and pests not existing in the importing country. In the same vein, a number of countries such as Australia, Japan, and the Republic of Korea exercise strict control over imports of fresh fruits, vegetables and flowers to prevent entry of exotic plant pests and diseases. Importation of such products are prohibited unless prior approval is obtained or a specific treatment given to the produce before exports (ITC, 2004). Therefore the use of pesticides becomes inevitable in order to succeed in export of agricultural products.

According to USAID (2012), compliance with MRLs is crucial for the continued growth of the Kenyan horticulture. With an increased number of interceptions frequently observed, there is need to enforce regulatory systems on chemical use in horticulture and ensure that a message is sent to all producers concerned by export of horticulture produce. For instance, the ban of dimethoate use on fruits and vegetables should contribute significantly to adherence to MRL requirements. Recently the government of Kenya introduced assistance for small growers by placing discounted prices on fertilisers purchased through the National Cereals Produce Board (NCPB), but it is not known whether this measure proven to be effective or not.

4. Methodology

This study was guided by a positivism research philosophy because the research results were obtained through the formulation and testing of the hypotheses. A descriptive and explanatory research design was applied by utilising qualitative and quantitative approaches. The population of the study consisted of the total number of ordinary members of the Fresh Produce Exporters Association of Kenya (FPEAK). The target population was 161 Fresh Produce Exporters which, according to FPEAK (2017), are the total number of its registered ordinary members in March 2017. Firm managers in charge of standards compliance for exporters of horticulture produce were selected for this study as they are the ones responsible for the safety and quality of the horticulture produce for export. The sample population was 115 units guided by Yamane's (1967) formula. A stratified random sampling was used to pick the sample units. A semi-structured questionnaire incorporating input use in horticulture was used to collect information about standards compliance in input use and internationalisation. The questionnaire was self-administered, using a drop and pick method. A pilot study was carried out on 12 respondents from counties surrounding Nairobi, to test the reliability and validity of the data collection tools. The number of respondents for the pilot study was 10% of the sample size. The quantitative data was entered in statistical package for social sciences (SPSS) for analysis. SPSS was chosen to other statistical software because it is user friendly. The statistics generated were descriptive and inferential statistics. The descriptive statistics included percentages and frequencies while the inferential statistics included Pearson Correlation and linear regression model. Qualitative data collected through interviews, focus groups, and open ended questions were processed and analysed following thematic approach. Emerging patterns of the key responses were identified and the relationship between the identified patterns studied.

5. Results

Out of 115 questionnaires distributed, 108 (94%) questionnaires were returned filled in and 7 (6%) respondents declined participation. This was a valid and reliable representation of the target population therefore appropriate for the study analysis. Majority of respondents (69%) who participated in this study were male while the remaining 31% were female. In addition, 88% of respondents were aged between 24 and 54 years of age, representing a large proportion of the active population of the country. Finally, 82% of the participants had high school or university level of education, while only 18% of respondents had a primary school level.

The paper sought to investigate the effect of standards compliance in input use on the internationalisation of Kenyan horticulture. As such, respondents were requested to indicate their level of agreement or disagreement with various statements related to input use in their horticulture farming intended for export. A Likert scale of 1-5 where 1 was the lowest and 5 the highest was used to show the level of agreement on the effect of input use on the internationalisation of Kenyan horticulture: 1=Strongly Disagree (SD), 2=Disagree (D), 3=Neutral (N), 4=Agree (A), and 5=Strongly Agree (SA). The data obtained in this respect is presented in the following Table.

Items	1(SD)	2(D)	3(N)	4(A)	5(SA)	Mean	Std. Deviation
I know very well recommended seeds for my horticulture produce for export.	2 (1.9%)	12 (11.1%)	35 (32.4%)	30 (27.8%)	29 (26.9%)	3.67	1.05
The recommended seeds are available at the local market.	2 (1.9%)	23 (21.3%)	50 (46.3%)	22 (20.4%)	11 (10.2%)	3.16	0.939
The recommended seeds are affordable.	15 (13.9%)	36 (33.3%)	52 (48.1%)	5 (4.6%)	0 (%)	2.44	0.789
Seeds certified locally are of same quality as imported certified seeds.	49 (45.4%)	59 (54.6%)	0 (%)	0 (%)	0 (%)	1.55	0.5
The water used in my farming is of good quality.	3 (2.8%)	14 (13%)	55 (50.9%)	22 (20.4%)	14 (13.0%)	3.28	0.946
The water needed for my farming is available in quantity.	4 (3.7%)	28 (25.9%)	43 (39.8%)	19 (17.6%)	14 (13%)	3.1	1.05
There is a need of proceeding with test of water.	50 (46.3%)	45 (41.7%)	13 (12%)	0 (%)	0 (%)	1.66	0.686
I am looking for type of horticulture produce consuming less water.	32 (39.6%)	51 (47.2%)	25 (23.1%)	0 (%)	0 (%)	1.94	0.727
I keep abreast with recommended fertilisers and pesticides for my horticulture produce.	4 (3.7%)	9 (8.3%)	42 (38.9%)	29 (26.9%)	24 (22.2%)	3.56	1.044
I can get recommended fertilisers and pesticides at the local markets.	3 (2.8%)	18 (16.7%)	45 (41.7%)	30 (27.8%)	12 (11.1%)	3.28	0.965
I can easily afford recommended fertilisers and pesticides.	12 (11.1%)	55 (50.9%)	39 (36.1%)	2 (1.9%)	0 (0%)	2.29	0.684
The enforcement of legislation requiring prior approval of fertilisers and pesticides in the Kenyan market is efficient.	16 (14.8%)	51 (47.2%)	41 (38%)	0 (0%)	0 (0%)	2.23	0.692

Table 1

The results of the study presented in above the Table shows that, most of the participants know very well recommended seeds for their horticulture produce for export (55%, mean=3.67), and keep abreast with recommended fertilisers and pesticides for their horticulture produce (49%, mean=3.56). However, despite the participants who agree on the two items, majority of participants disagree on the fact that seeds certified locally are of same quality as imported certified seeds (100%, mean=1.55). They also disagree that there is a need of proceeding with test of water (88%, mean=2.66) and that they were looking for a type of horticulture produce consuming less water (87%, mean=1.94). They further disagree that they can easily afford recommended fertilisers and pesticides (62%, mean=2.29), and disagree that the enforcement of legislation requiring prior approval of fertilisers and pesticides in the Kenyan market is efficient (62%, mean=2.23), and that the recommended seeds are affordable. (47%, mean=2.44).

A number of participants were neutral on the fact that the water used in their farming was of good quality (51%, mean=3.25), and that the recommended seeds are available at the local market (46%, mean=3.16). They were also neutral on the fact of getting recommended fertilisers and pesticides at the local markets (42%, mean=3.28), and that the water needed for their farming was available in sufficient quantity (40%, mean=3.1). During interviews, it was revealed that most of the producers do not proceed with risk assessment to ensure that soil, climate and other conditions are appropriate for given crops. Most of them do not have competences to make risk assessment, and therefore outsource that service at an expensive cost. Furthermore, they insisted on the crucial role that was supposed to be played by extension officer in horticulture. All of them were unanimous that these officers are very rare on the field and when met, they are not competent.

5.1. Keeping Abreast with Recommended Fertilisers and Pesticides by Category of Horticulture Produce

A cross tabulation between keeping abreast with recommended fertilisers/pesticides, and category of horticulture produce was done and the findings are presented in the following table:

Category of Horticulture Produce	Keeping Abreast with Recommended Fertilisers and Pesticides					Total
	1 (SD)	2 (D)	3 (N)	4 (A)	5(SA)	
Flowers	1 (0.9%)	0 (0%)	3 (2.8%)	7 (6.5%)	4 (3.7%)	15 (14%)
Vegetables	1 (0.9%)	7 (6.5%)	24 (22.2%)	13 (12%)	15 (14%)	60 (55.6%)
Fruits	1 (0.9%)	2 (1.8%)	9 (8.3%)	7 (6.5%)	3 (2.8%)	22 (20.4%)
Herbs	4 (3.7%)	5 (4.6%)	2 (1.8%)	0 (0%)	0 (0%)	11 (10.2%)
Total	7 (6.5%)	14 (13%)	38 (35.2%)	27 (25%)	22 (20.4%)	108 (100%)

Table 2

These findings indicate that majority of participants in the category of flowers (10%), vegetables (26%) and fruits (9%) agreed on keeping abreast with recommended fertilisers and pesticides, whereas majority of participants in the category of herbs (8%) disagree on keeping abreast with recommended fertilisers and pesticides.

5.2. Availability of Recommended Fertilisers and Pesticides and Category of Horticulture Produce

A cross tabulation between the availability of recommended fertilisers/pesticides, and category of horticulture produce was done and the results are presented in the following table:

Category of Horticulture Produce	Availability of Recommended Fertilisers and Pesticides at the Local Market					Total
	1 (SD)	2 (D)	3 (N)	4 (A)	5(SA)	
Flowers	0 (0%)	1 (0.9%)	4 (3.7%)	8 (7.4%)	2 (1.8%)	15 (14%)
Vegetables	0 (0%)	13 (12%)	27 (25%)	13 (12%)	7 (6.5%)	60 (55.6%)
Fruits	2 (1.8%)	3 (2.8%)	11 (10.2%)	5 (4.6%)	1 (0.9%)	22 (20.4%)
Herbs	3 (2.8%)	6 (5.5%)	2 (1.8%)	0 (0%)	0 (0%)	11 (10.2%)
Total	5 (4.6%)	23 (21.3%)	44 (40.7%)	26 (24%)	10 (9.3%)	108 (100%)

Table 3

The results in the table above indicate that majority of participants in the category of flowers (9%) agreed on the availability of recommended fertilisers and pesticides, yet majority of participants in the category of herbs (8%) disagreed on this item. Most participants in the category of vegetables (25%) and fruits (10.2%) were neutral on availability of recommended fertilisers and pesticides.

5.3. Affordability of Recommended Fertilisers and Pesticides by Category of Horticulture Produce

A cross tabulation between the affordability of recommended fertilisers and pesticides, and category of horticulture produce was done and the findings are presented in the following table:

Category of Horticulture Produce	Affordability of Recommended Fertilisers and Pesticides					Total
	1 (SD)	2 (D)	3 (N)	4 (A)	5(SA)	
Flowers	2 (1.8%)	7 (6.5%)	6 (5.5%)	0 (0%)	0 (0%)	15 (14%)
Vegetables	5 (4.6%)	29 (26.9%)	24 (22.2%)	2 (1.8%)	0 (0%)	60 (55.6%)
Fruits	3 (2.8%)	14 (13%)	5 (4.6%)	0 (0%)	0 (0%)	22 (20.4%)
Herbs	2 (1.8%)	6 (5.5%)	3 (2.8%)	0 (0%)	0 (0%)	11 (10.2%)
Total	12 (11%)	56 (51.9%)	38 (35.2%)	2 (1.8%)	0 (0%)	108 (100%)

Table 4

The results presented in above Table show that majority of participants in all categories: flowers (8%), vegetables (31%), fruits (16%), and herbs (7%) disagreed on affordability of recommended fertilisers/pesticides in Kenya.

5.4. Efficiency of Enforcement of Legislation Requiring Prior Approval of Fertilisers/Pesticides and Category of Horticulture Produce

The Table below presents a cross tabulation between enforcement of legislation requiring prior approval of fertilisers/pesticides and category of horticulture produce.

Category of Horticulture Produce	Efficiency of Enforcement of Legislation Requiring Prior Approval of Fertilisers and Pesticides					Total
	1 (SD)	2 (D)	3 (N)	4 (A)	5(SA)	
Flowers	1 (0.9%)	8 (7.4%)	6 (5.5%)	0 (0%)	0 (0%)	15 (14%)
Vegetables	8 (7.4%)	28 (26%)	24 (22.2%)	0 (0%)	0 (0%)	60 (55.6%)
Fruits	5 (4.6%)	10 (9.3%)	7 (6.5%)	0 (0%)	0 (0%)	22 (20.4%)
Herbs	4 (3.7%)	6 (5.5%)	1 (0.9%)	0 (0%)	0 (0%)	11 (10.2%)
Total	18 (16.7%)	52 (48.1%)	38 (35.2%)	0 (0%)	0 (0%)	108 (100%)

Table 5

The findings depicted in the above Table indicate that majority of participants in all categories: flowers (8%), vegetables (33%), fruits (14%), and herbs (9%) disagreed on efficiency of enforcement of legislation requiring prior approval of fertilisers and pesticides.

An analysis was undertaken for the null hypothesis that "the standards compliance in input use has no significant influence on the internationalisation of Kenyan horticulture".

A correlation test was used to determine the significance of the correlation between the standards compliance in input use and the internationalisation of Kenyan horticulture. The result is shown in the Table below.

		Input Use	Internationalisation
Input use	Pearson Correlation	1	.484**
	Sig. (2-tailed)		.000
	N	108	108
Internationalisation	Pearson Correlation	.484**	1
	Sig. (2-tailed)	.000	
	N	108	108

Table 6

** . Correlation is significant at the 0.01 level (2-tailed)

The data depicted in the Table above indicates a moderate positive and statistically significant relationship between standards compliance in input use and the internationalisation of Kenyan horticulture ($r=0.484$, $p\text{-value}=0.00$). This implies that as the value of standards compliance in input use increases, so does the value of the internationalisation of Kenyan horticulture.

Furthermore, the analysis of the regression model indicates that the standards compliance in input use statistically predict value of the internationalization of Kenyan Horticulture ($\text{Beta}=0.484$, $t=4.277$, $p\text{-value}=0.00<0.05$).

Coefficients ^a						
Model		Un-standardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.78	0.426		4.175	0
	input	0.674	0.157	0.484	4.277	0

Table 6

a. Dependent Variable: Internationalization

$R^2 = 0.147$, $F=18.295$ A. Dependent Variables: Internationalization

From the general form of regression model Y (Internationalisation) $=\beta_0 + \beta_1 X_i + \epsilon$, the regression analysis established that $Y=1.78+0.484 X+0.157$.

The value of variance $R^2 = 0.147$, shows that 14.7% of the internationalization is explained by input. The values of F (18.295) $=7.877$, $p\text{-value}=0.00$, show that input use is statistically significant predictor of the internationalization (i.e., the regression model is a good fit of the data) and the value of input use is statistically significant ($t=4.277$, $p\text{-value}=0.00$), hence, affects the internationalization. Therefore, the study accepts the alternative hypothesis that "the standards compliance in input use has significant influence on the internationalization of Kenyan horticulture". The model shows that input use positively affects the internationalization, i.e. a mean index increase in input use increases the internationalisation of Kenyan horticulture by a positive unit mean index value of 0.484.

6. Discussions, Conclusions and Recommendations

6.1. Discussion

Input use during farming of horticultural crops has a direct impact on safety and quality of the crops (SAFEACC, 2015). This study examined the relationship between standards compliance in input use and the internationalisation of Kenyan horticulture. The findings established that standards compliance in input use has a very positive effect on the internationalisation of Kenyan horticulture, which is statistically significant ($r=0.484$, $p\text{-value}<0.05$).

This study established that producers and exporters have good knowledge of the recommended seeds and to a certain extent, those recommended seeds are available at the local market. This is in line with the findings of USAID (2012) which indicated that the business of horticulture seeds production is well established and efficient in Kenya due to high demand of imported seeds on the national and regional level. During interviews, it was revealed that some specific seeds are very rare and even not present at all in the local market because seed importers' are only interested in seeds which have high demand. This is a big challenge for some exporters who would like to venture in new produce where the market is not yet saturated such as herbs and edible flowers etc. Not getting those specific seeds in the local market is an obstacle to the diversification strategy in export which is appropriate to adapt to the stiff competition in the international market of horticulture produce. According to Sikinyi (2010), horticultural seeds traded in Kenya are comprised of locally produced seeds and imported seeds. Our study revealed that seeds produced and certified locally are of lower quality than imported certified seeds. This is in agreement with ADF (2007) which expressed a concern of poor quality of horticultural seeds produced in Kenya. The study revealed also that the seeds are very expensive on the local market and during interviews; producers/exporters suggested the need to improve research on the horticultural seeds to get locally produced seeds of good quality at a fair price. In fact, it was noted that from the past, the Kenya Agricultural Research Institute (KARI) has put effort in getting appropriate seeds for traditional crops like coffee and tea and less attention was given to seeds for horticultural crops. In this case, the example of

India can be a good reference where Kumar & Ali (2010) noted that, realizing the importance of availability and quality seeds for horticultural farming, the government policies were geared towards promoting and fostering entrepreneurship in the seed industry.

Warrington (2011) asserts that the issue facing horticulture production all over the world is the availability of water and according to Sharm & Alam (2013), water is a valuable agricultural input and availability of water is the most relevant issue that is facing horticultural production in almost all areas of the world. This study revealed that majority of participants were neutral on whether the quantity of water required for horticultural farming was sufficient or was of good quality. This is not fully in line with RSA (2015) which asserted that in the Kenyan horticultural activities, the quantity of water available is insufficient while the quality is continually declining. The Africa Development funds (2007) has indicated that in the Kenyan farming activities, water remains a major challenge as the agriculture largely depends on seasonal rainfall, but the amount of rainfall has not been adequate to sustain crop production. During interviews, producers and exporters were unanimous that water is a critical factor for the success of horticulture for export. The main challenge they are facing in this regard is linked to the unpredictability of rain season and the period of drought. The smallholder producers indicated that currently, they are experiencing long period of drought or unexpected raining season which affects the quality and quantity of crops. Most of them do not use borehole for irrigation purpose as this system is considered very expensive, hence not affordable. Without an efficient irrigation system, they are not able to perform farming throughout the year in order to meet the demand of horticulture produce in the international market, which insists on a year round production. This is in agreement with ADF (2007) which indicated that the provision of adequate water for irrigation is critical to increase production in horticulture as less than 20% of Kenya is arable and the rest are either arid or semi-arid zones. They emphasized the need of developing different technologies for the better management of water. In this respect and looking at the seriousness of water concern in horticulture, Warrington (2011) recommended urgent researches to resolve related issues such as development of drought tolerant crops, the management of crops under the managed water deficits, dealing with increased salinity, and the use of lower quality water. Most of the respondents highlighted the lack of knowledge related to technology of harvesting the rainfall water or treatment of waste and/or poor quality water for irrigation. This is in line with ASCU (2012) which noted that the main challenges related to water in the Kenyan horticulture remain the low level of water harvesting for irrigation.

The study revealed that most of the participants do not understand the need to proceed with water testing, and they do not look for the type of horticulture produce which consumes less water. During interviews, most of them claimed to be using water of good quality. However, the issue of taking water for testing to ensure that it was of good or bad quality was a bit strange for them. Furthermore, they asserted that the choice of type of crops cultivated for export is driven by the need expressed on international market and not by the resistance of crops to drought season. There is no research related to aspects of development of drought tolerant crops, management of crops under managed water deficit, use of low quality/waste water, or use of simple greenhouses etc.

This study established that except for herbs, respondents in other categories of horticulture produce have sufficient knowledge of fertilisers and pesticides required for their farming in order to comply with international standards for export. In addition, recommended fertilisers and pesticides to comply with standards are generally available but still very expensive. Majority of the respondents consider inefficient the enforcement of legislation requiring prior approval of fertilisers and pesticides in the Kenyan market. According to ITC (2004), farmers are often tempted to use excessive pesticides in order to ensure that exports of fresh fruits and vegetables are not banned by importing countries because of the presence of pests and diseases. During interviews, participants indicated that instead of using recommended products which are expensive, some producers go for counterfeit or banned products because they are cheap and effective in managing pest and diseases, though not safe as they are harmful to human beings. They indicated having observed that the safer the product, the more expensive it becomes. Hence, they criticised the international market which regulates the type of products to use as concerned regulations keep on changing and the new product recommended are always more expensive than the previous one. Therefore, it becomes confusing and difficult to adapt to frequent changes of recommended products.

USAID (2012) indicated that compliance with MRLs is crucial for the continued growth of the Kenyan horticulture. Respondents observed that in the first years, smallholder farmers try to follow instructions related to the use of fertilisers and pesticides to avoid compromising with the quality of the produce. With time, however, they go back to bad practices that reduce the cost of production by, sacrificing the quality as far as the use fertilisers and pesticides is concerned. Unfortunately when the substandard produces are intercepted, it does not only affect the concerned consignment. In addition, it damages the reputation for horticulture produce in that category and results in an immediate ban which might take a long time before it is lifted. This is in line with ITC (2004) which indicated that exporters of fresh fruits and vegetables from a number of developing countries are apprehensive about complying with MRLs requirements which are causing them serious problems. Producers of herbs face a particular challenge of not getting products specifically certified for their crops. In such case, they use the products indicated for vegetables or flowers which are not necessary appropriate for herbs. During export, they are requested to justify the kind of products used and face high risk of getting their produce rejected.

6.2. Conclusion

This study examined the effect of standards compliance in input use on the internationalisation of Kenyan horticulture. A Pearson Correlation test to examine the relationship between standards compliance in input use and the

internationalisation of Kenyan horticulture revealed a moderate positive and statistically significant relationship between standards compliance in input use and the internationalisation of Kenyan horticulture ($r=0.484$, $p\text{-value}=0.00$). The results of linear regression indicated that standards compliance in input use statistically predict value of the internationalization of Kenyan Horticulture ($\text{Beta}=0.484$ $t=4.277$, $p\text{-value}=0.00<0.05$).

The study analysed the effect of seeds, water, fertilisers and pesticides used in horticulture on the internationalisation of Kenyan horticulture. The findings of this study revealed that producers are aware of recommended seeds and those seeds are available at the local markets, though they are very costly. The seeds produced and certified locally are not of good quality and seed importers focus more on the seeds with high demand in the local markets. Some specific seeds which would contribute to the diversification of Kenyan horticulture produce for export are not available at the local markets because they do not have a high demand; hence the importers are not interested in them. This situation slows down the effort of diversification of the Kenyan horticulture produce to the international markets, where competition in the traditional horticulture produce for export is becoming stiff. Water is a critical factor for success in horticulture for export; however producers are facing a major challenge of unpredictability of raining season and the period of drought. This is more challenging to smallholder producers who do not have the capability of getting boreholes for irrigation purpose as they are not affordable. Furthermore, there is a lack of knowledge related to technology of harvesting the rainfall water or treatment of waste /or poor quality water for irrigation. Producers have not yet understood the need to proceed with water testing to ensure that water used in farming is of good quality. The choice of type of crops for farming is determined by the availability of the market and not by the resistance of crops to the drought season (drought tolerant crops). Except for herbs, recommended fertilisers and pesticides for other horticulture produce are available at the local market and producers have good knowledge of them. However, those fertilisers and pesticides are expensive and for that reason, some producers use counterfeit or banned products with serious consequences to export.

6.3. Recommendations

This study recommends more research to be carried out in order to develop locally appropriate seeds in horticulture farming with emphasis on specific crops that would bring a competitive edge. A comprehensive program of seed production in horticulture farming should be established, and the training of competent personnel organised accordingly. Furthermore, the government in conjunction with horticulture producers and exporters need to broaden the horticultural development strategy to diversify horticultural crops. Hence, they should initiate a dialogue with importers of seeds to ensure that during importation, seeds that contribute to diversification of horticulture crops are not left out. This study recommends a systematic risk assessment of soil and water. Considering the challenges of getting enough water for horticulture farming is worsened by the unpredictability of the raining season and prolonged drought period, the study recommends increasing research on crops which are less demanding of water, to develop and disseminate alternative methods of water management such as rainfall water harvesting, treatment of waste water, and to encourage efforts in irrigation. As newly recommended products continue to be more expensive, pushing producers to use shortcuts, hence get products of less quality, the Pest Control and Products Board (PCPB) should put in place a controlling mechanism to ensure that subsidies of fertilisers and pesticides lead to the affordability of the products, and at the same time, it should set up an efficient monitoring system of illegal and counterfeit products.

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