

Selected Factors Influencing Total Value of Horticultural Export in Kenya

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ABSTRACT: Kenya's horticultural export performance plays a significant role in driving the country's economic growth. The nation engages in international trade with numerous countries, with the East African Community emerging as the leading destination for Kenya's exports. However, an overreliance on domestic markets has contributed to lower local prices for horticultural produce, highlighting the need to tap into international markets for better returns. The primary objective of this study was to examine the factors influencing the total value of horticultural exports in Kenya. Specifically, the study aimed to assess the effects of exchange rate, interest rate, and inflation on horticultural export performance. The research was grounded in the export-led growth theory and Marshall-Lerner Condition and employed a longitudinal research design using data from the Kenya National Bureau of Statistics (KNBS) spanning a 30-year period (1995–2024). The study employed the Vector Error Correction Model (VECM) to analyze the determinants of horticultural export performance in Kenya and to provide policy recommendations aimed at promoting favorable exchange rates, terms of trade, and controlled inflation. To ensure the robustness of the regression results, stationarity tests were conducted using both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. These tests confirmed that all variables became stationary after first differencing. The long-run VECM analysis revealed that inflation, exchange rates and interest rates significantly influenced the total value of horticultural exports. Based on these findings, the study recommends the implementation of inflation control measures to stabilize input costs and maintain the competitiveness of Kenyan horticultural products in global markets. The study suggested adopting exchange rate management policies to reduce excessive volatility and create a stable environment for exports. Enhancing access to affordable credit through reduced interest rates and targeted agricultural financing will empower farmers to invest in modern technologies and infrastructure.

KEY WORDS: Vector Error Correction Model (VECM), Total Value of Horticultural Export in Kenya

OPERATIONAL DEFINITION OF TERMS

Exchange Rate: The price at which one currency can be exchanged for another between different countries. It influences the relative cost of exports and imports.

Terms of Trade: A measure that compares a country's export prices to its import prices. It indicates the rate at which one country's goods exchange for those of another and reflects trade competitiveness.

Inflation Rate: The rate at which the general level of prices for goods and services rises in an economy over time, reducing purchasing power.

Rainfall: The total amount of rainfall in millimeters that falls within a specific geographic area over a defined time period. It is a critical input in agricultural production.

Value of Horticultural Exports: The total monetary worth of all exported horticultural products in Kenya shillings, including revenues from fruits, vegetables, and flowers sold to international markets.

Horticultural Sub-sector: For the purposes of this study, this includes the cultivation and export of fruits, vegetables, and flowers.

Background of the study

Exports play a vital role in driving economic growth, and their expansion is a key component of the overall development process. Export promotion has become a central issue in commercial policy, attracting significant attention at both national and international levels (Freixanet, 2022). Many countries are prioritizing the promotion of their export products, particularly in

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response to shrinking domestic markets. A nation's export sector is a critical engine of growth, largely due to the foreign exchange it generates. This is clearly illustrated in Kenya's horticultural sub-sector, which has emerged over the past decade as a major contributor to foreign exchange earnings and employment creation.

Across several African countries, horticultural export sub-sectors are playing an increasingly important role in economic development (Barrett et al., 2022). In Kenya, the sub-sector has drawn significant interest from international and local researchers, the government, and donors alike, owing to its rapid growth and consistent export performance, especially to European markets Europe (Samoei & Kipchoge, 2021). Notably, in December 2011, the United States opened its market to Kenyan French beans following five years of promotional efforts by fresh produce growers. This milestone points to the potential for expanding Kenya's horticultural exports into new markets beyond Europe.

The USA Department of Agriculture indicated that Kenya had improved on the conditions required before being allowed to export French beans to the country. These conditions were mainly washing, processing and packaging. This will be a good opportunity for the country to expand the export sub-sector. The horticultural sector has significantly grown over the last decade to become the second biggest foreign exchange earner (after tea), employer (both directly and indirectly) and contributor to the food requirements in the country.

The European market is the largest export destination and the major importing countries are: the United Kingdom, France, Netherlands, Belgium and Germany. It should be noted that even if the horticultural sector exports are significant, they only constitute a small percentage of the total horticultural production.

Kenya lags behind its neighbors in credit access, costs of labor, sea, and air freight costs in the horticultural sub-sector (Orlale, 2023). This was concluded after studying the horticultural sub-sectors of Kenya, Uganda, Tanzania, Ethiopia, Egypt and Ecuador. The report indicates that high interest rate charged by the commercial banks in Kenya discourages borrowing by the growers.

The United States Department of Agriculture confirmed that Kenya had met the necessary requirements primarily in the areas of washing, processing, and packaging before being granted permission to export French beans to the U.S. market. This development presents a valuable opportunity for Kenya to further expand its horticultural export sub-sector. Over the past decade, the horticultural sector has experienced substantial growth, becoming the country's second-largest source of foreign exchange (after tea), a major employer both directly and indirectly and a contributor to national food security.

Europe remains the primary export destination, with key markets including the United Kingdom, France, the Netherlands, Belgium, and Germany. However, despite the sector's export success, exports still represent only a small fraction of total horticultural production in Kenya.

According to (Orlale, 2023), Kenya lags behind neighboring countries such as Uganda, Tanzania, Ethiopia, and Egypt and Ecuador, in terms of access to credit, labor costs, and sea and air freight expenses within the horticultural sub-sector. The study highlights that high interest rates charged by commercial banks in Kenya act as a deterrent to borrowing among horticultural producers, hindering the sector's full potential.

Statement of the Problem

Horticultural production in Kenya can be regarded as a success story. However, when comparing the volume of horticultural exports to total production, it becomes clear that exports account for only about five percent. This indicates that Kenya's export performance falls short of its potential, especially when considering the country's overall agricultural output, economic size, population and arable land availability. The over-reliance on domestic markets has led to suppressed local prices for horticultural produce, underscoring the need to better exploit international markets.

While the horticultural export sub-sector has recorded notable growth in earlier years, it has largely stagnated over the past decade. Domestic production continues to dominate, and the export segment has experienced a deceleration in its growth rate. This slowdown suggests that Kenya has not fully capitalized on the foreign exchange potential of horticultural exports (Kemei, 2024). Against this backdrop, the present study sought to examine the factors influencing the total value of horticultural exports in Kenya.

Specific objectives

- ❖ To determine the effect of rainfall on the total value of horticultural export in Kenya
- ❖ To establish the effect of exchange rate on horticultural export performance in Kenya
- ❖ To evaluate the effect of interest rate on the total value of horticultural export in Kenya
- ❖ To analyze the effect of inflation on the total value of horticultural export in Kenya

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LITERATURE REVIEW

Export-led Growth Hypothesis

The export-led growth theory posits that the expansion of exports is a key driver of economic growth. According to this theory, a country's overall economic development can be stimulated not only through increased labor and capital investment but also through the expansion of its export base. In this context, the horticultural sector plays a significant role in Kenya's development trajectory.

Research by Mwangi, (2021) highlights that the horticultural sector is strongly associated with wealth creation, poverty reduction, and the advancement of gender equity, particularly in rural communities. This sector is considered vital to the national economy due to its substantial contribution to employment, offering livelihood opportunities to millions of Kenyans.

Marshall-Lerner theory

The Marshall-Lerner Condition is a key economic concept that describes how exchange rate movements influence a country's trade balance. It asserts that a depreciation of a nation's currency will lead to an improvement in its trade balance only if the sum of the absolute values of the price elasticities of demand for exports and imports exceeds one. This condition is essential for analyzing the effects of exchange rate changes on macroeconomic performance.

Under the Marshall-Lerner framework, a depreciation makes domestic goods more competitively priced for foreign buyers, thereby boosting export volumes. At the same time, it raises the cost of imported goods for domestic consumers, leading to a reduction in import demand. If the demand for both exports and imports is sufficiently price-elastic, the rise in export revenues will outweigh the increase in import costs, resulting in a net improvement in the trade balance (Nostell, 2024).

Conversely, if the combined price elasticity of exports and imports is less than one, a depreciation may initially worsen the trade balance a situation known as the J-curve effect. This short-term deterioration occurs as existing contracts and consumption habits persist, but over time, the trade balance typically improves as economic agents adjust to the new relative prices.

RESEARCH METHODOLOGY

Research Design

The study used longitudinal research design, a time series in nature and it involved the measurement of a single variable over a period of time.

Resources and Types of Data

The study relied on secondary data obtained from KNBS, the World Bank, HCDA, and Treasury publications and reports.

Table 3.1 Definitions and Measurement of variables

Variable	Definitions	Measurements
Inflation Rate	Persistent price increase of goods and services over a given period	Percentage
Exchange Rate	The Value of Kenya's currency against the US dollar	Percentage
Interest Rate	Proportion of a loan that is charged as interest to the borrower	Percentage
Value of Horticultural Exports	Total monetary value of goods from horticulture	Kshs. (Millions)

Researcher Compilation, 2025

Model Specification

The study adopted a model from (Boug, 2020), who developed it to examine how Norwegian exporters of machinery and equipment factor in their competitors' costs when determining export prices.

The adapted model is expressed as follows:

$$\text{VolEXP} = (\text{EXR}, \text{INF}, \text{INTR},) \dots \dots \dots (3.1)$$

Whereby;

VolEXP. = volume of exports

INF. =inflation

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EXR. = exchange rates

INTR= Interest rates

The data analysis employed the Vector Error Correction Model (VECM), which was specified in its general form as:

$$\Delta \text{volExp}_t = f(\Delta \text{INF}_t, \Delta \text{INTR}_t, \Delta \text{EXR}_t, \Delta \text{RAINFALL}_t) \dots \dots \dots 3.3$$

Model Diagnostic Tests

Normality Test

The null hypothesis of normality was tested against the alternative hypothesis of non-normality. To assess this, a test based on skewness and kurtosis was employed, as proposed by (Black et al., 2024).

Portmanteau Test

Portmanteau tests for autocorrelation in the residuals of a model. The study used Lagrange Multiplier (LM (Wenning & Valenci, 2019).

Multicollinearity

Multicollinearity is a situation in which two or more explanatory variables in a multi- regression model are strongly linearly related. The variance inflation factor, (VIF) was used to check for multicollinearity.

Heteroscedasticity

According to (Srivastava, 2020), heteroscedasticity occurs when the variance of the random error term is not constant, whereas homoscedasticity exists when the error term has a constant variance.

RESULTS, ANALYSIS AND INTERPRETATION

Descriptive Statistics

Before estimating the model, the study first assessed the general characteristics of the data by examining measures of central tendency namely the mean, median, minimum, maximum, and standard deviation. This step also allowed for the identification and removal of any outliers.

Table 4. 1 Descriptive statistics

Variable	Observations	Mean	Std. dev	Minimum	Maximum
HORTC	30	7.55e+10	5.12e+10	5.31e+08	1.87e+11
INF	30	8.203328	4.581029	1.554328	26.23982
EXR	30	86.32506	21.62086	51.42983	139.8464
INTR	30	17.49819	5.979047	11.99578	33.78667

Source: Author (2025)

Whereby;

HORTC= Horticultural exports, INF= Inflation, EXR= exchange rate INTEL= Lending interest rate.

Unit Root Tests

Table 4. 2 Augmented Dickey Fuller Test for Unit Root at Levels and at First Difference

Unit Root Test at Level							
Variables	Mackinnon values	p- values	Test Statistic	Critical Values			Remark
				1%	5%	10%	
HORTC	0.9971		1.174177	-3.689194	-2.971853	-2.625121	Unit root
INF	0.0009		-4.633615	-3.679322	-2.967767	-2.622989	Stationary
EXR	0.9684		0.208002	-3.679322	-2.967767	-2.622989	Unit root
INTR	0.2848		-2.000967	-3.679322	-2.967767	-2.622989	Unit root
Unit Root at First Difference							
HORTC	0.0000		-10.72165	-3.689194	-2.971853	-2.625121	I (1)
INF	0.0000		-7.735594	-3.699871	-2.976263	-2.627420	I (1)

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EXR	0.0006	-4.792767	-3.689194	-2.971853	-2.625121	<i>I (1)</i>
INTR	0.0001	-5.590904	-3.689194	-2.971853	-2.625121	<i>I (1)</i>

Source: Authors Compilation from STATA Output, 2025

The results of the Augmented Dickey-Fuller (ADF) unit root test at the first difference, as shown in the table, indicate that all the variables become stationary after first differencing, implying they are integrated of order one, $I(1)$.

Philips Perron Test for Unit Root Test

Unlike the Augmented Dickey-Fuller (ADF) test, which addresses autocorrelation by incorporating lagged differences, as noted by (Matundura, 2021).

Table 4. 2.1 Philips – Perron Test for Unit Root at Levels and at First Difference

Unit Root Test at Level							
				Critical Values			
Variables	Mackinnon p-values	Test Statistic		1%	5%	10%	Remark
HORTC	0.7749	-0.896515		-3.679322	-2.967767	-2.622989	Unit root
INF	0.0008	-4.697357		-3.679322	-2.967767	-2.622989	Stationary
EXR	0.9711	0.248987		-3.679322	-2.967767	-2.622989	Unit root
INTR	0.248987	0.9711		-3.646342	-2.967767	-2.622989	Unit root
Unit Root at First Difference							
HORTC	0.0000	-8.831761		-3.689194	-2.971853	-2.625121	Stationary
INF	0.0000	-8.690013		-3.689194	-2.971853	-2.625121	Stationary
EXR	0.0001	-29.19108		-3.689194	-2.971853	-2.625121	Stationary
INTR	0.0001	-5.601094		-3.689194	-2.971853	-2.625121	Stationary

The regression results IN Table 4. 2.1 indicated that all factors (HORTC, INF, EXR, INTR, and RAINFALL) were stationary at first difference since their p-values were less than 0.05 level of significance.

Table 4. 3 Johansen Test for Cointegration

Lags=4

Sample: 1995-2024

Maximum rank	Parms	LL	Eigenvalue	Trace Statistic	5%Critical alue
0	30	-366.5621		75.3659	68.52
1	39	-352.2640	0.63987	46.7696*	47.21
2	46	-341.1511	0.54786	24.5440	29.68
3	51	-332.6728	0.45425	7.5874	15.41
4	54	-328.9436	0.23385	0.1289	3.76

The results revealed the existence of one cointegrating equation in the long run.

Source: Research Data, 2025

4.4 Vector Error Correction - Model long Run and Test of Hypotheses

Based on the test results presented in the table above, there is clear evidence of a long-run cointegration relationship among horticultural exports, inflation, the exchange rate, and the lending interest rate. Consequently, the study proceeds to estimate the parameters using the Vector Error Correction Model (VECM), which captures both short-run dynamics and long-run equilibrium adjustments.

To confirm the existence of a long-term relationship among the variables, the cointegration equation ($_ce1$) must have a negative coefficient and be statistically significant at the 5% level. As shown in the table below, the cointegrating equation meets these criteria, with a p-value of 0.028 below the 0.05 threshold. The estimated error correction term is -0.0951598, indicating a long-run equilibrium relationship among inflation, the exchange rate, the lending interest rate, rainfall, and horticultural export

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performance. This implies that any short-term deviations from the long-run equilibrium are gradually corrected over time, thereby promoting stability among these macroeconomic variables.

The absolute value of the error correction term showed that about 95.16% of any deviation in horticultural export performance is corrected from the previous period's shocks. This suggests that past fluctuations in inflation, exchange rates, interest rates, and rainfall have a significant short-run impact on current horticultural export levels. The findings indicate that Kenya's horticultural export performance is highly sensitive to short-term departures from its long-run path, underscoring the importance of macroeconomic stability for the sustainability of the sector (Tekalign & Goshu, 2021).

Table 4. 4 Johansen long Run cointegration

Equation	Parms	chi2	P>chi2
_ce1	4	184.2953	0.0000

	Coef.	Std. Err	Z	P > z	(95% Conf. Interval)
Log hort					
_ce1					
Log Inf	- 1.417866	.3251298	-4.36	0.000	.7806229 2.055108
Log Exr	1.972441	.7094292	2.78	0.005	-3.362897 -.5819856
Log Intr	-1.284829	.4109462	-3.13	0.002	.4793897 2.090269
Log Rainfall	-3.177669	.5285937	6.01	0.000	2.141644 4.213693
CONS	-44.33517	0.5884	0.0700	0.9420	-1.1102 1.1961

Source: Research Data, 2025

Vector Error Correction - Model long Run and Test of Hypotheses

The Effect of Inflation on the Value of Horticultural Exports

The first hypothesis of the study posited that inflation has no significant effect on the total value of horticultural exports in Kenya. However, the regression analysis results presented in Table 4.4 revealed a statistically significant coefficient of -1.4179, with a p-value of 0.0000 (which is less than the 0.05 significance level). As a result, the null hypothesis was rejected. These findings suggest that a one-unit increase in inflation leads to a 1.4179-unit decrease in the value of horticultural exports. This inverse relationship is consistent with economic theory, which asserts that rising inflation elevates domestic production costs, reduces export competitiveness, and increases price volatility.

These results align with the findings of Kiriti-Nganga et al. (2022), who also reported a significant negative impact of inflation on international trade and export performance. Elevated inflation raises the cost of key inputs such as fertilizers, seeds, transportation, and labor—thereby undermining the competitiveness of Kenyan horticultural products in global markets.

The effects of exchange rate on the total value of horticultural exports in Kenya

The second hypothesis of the study stated that the exchange rate has no significant effect on the total value of horticultural exports in Kenya. However, the regression analysis in Table 4.4 revealed a statistically significant coefficient of 1.9724 with a p-value of 0.005 (less than the 0.05 threshold), leading to the rejection of the null hypothesis. These results indicate that a one-unit increase in the exchange rate implying a depreciation of the Kenyan shilling results in a 1.9724-unit increase in the value of horticultural exports.

This positive relationship between exchange rate depreciation and export growth is consistent with the Marshall-Lerner Condition. According to this theory, currency depreciation enhances a country's trade balance if the sum of the price elasticities of exports and imports exceeds one. In such a scenario, the increased demand for relatively cheaper exports outweighs the costlier imports,

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yielding a net positive impact on trade. A depreciated currency improves price competitiveness, making Kenyan horticultural products more appealing to international markets.

These findings are supported by the study of Kosgei (2021), which investigated the effects of exchange rate fluctuations on horticultural export earnings in Kenya. The study concluded that depreciation of the Kenyan shilling led to increased export revenues, further affirming the critical role of exchange rate movements in influencing international trade outcomes.

The Effect of Interest Rate on the Value of Horticultural Exports

The third hypothesis posited that interest rates have no significant effect on the total value of horticultural exports in Kenya was examined using the Johansen long-run cointegration results. The regression analysis revealed a statistically significant negative relationship between interest rates and horticultural export earnings. Specifically, the coefficient for interest rates was estimated at -1.284829, with a standard error of 0.4109462 and a p-value of 0.002, indicating strong significance at the 5% level. These results support the rejection of the null hypothesis and underscore the important role of borrowing costs in influencing export performance in the horticultural sector.

This negative relationship can be attributed to the fact that interest rates directly affect the cost of borrowing for horticultural exporters. As interest rates rise, the cost of financing agricultural operations including the purchase of essential inputs such as fertilizers, pesticides, and improved seedlings also increase. High lending rates elevate the costs associated with expanding greenhouse infrastructure and managing export logistics. As borrowing becomes more expensive, farmers and exporters may be discouraged from investing in productivity-enhancing activities, leading to reduced output and consequently lower export earnings.

Horticultural exporters often depend on short-term credit facilities to bridge cash flow gaps between production cycles and payments from international buyers. When domestic interest rates increase, the cost of financing working capital rises, making credit more expensive. This limits exporters' ability to offer competitive prices in global markets, thereby reducing demand for Kenyan horticultural products. Moreover, higher financing costs hinder exporters' capacity to provide favorable payment terms or absorb international price fluctuations, diminishing their competitiveness abroad.

These findings are consistent with the work of Meme (2015), who analyzed the performance of Kenya's horticultural exports and found that macroeconomic variables, particularly interest rates, significantly influenced export revenues. The study concluded that higher interest rates undermined export performance by raising the cost of borrowing, thus eroding the international competitiveness of Kenyan horticultural products. The results point to the need for stable interest rate regimes and supportive financial policies to enhance the growth and sustainability of Kenya's horticultural export sector.

Jarque-Bera Normality Test

Table 4. 5 Jarque-Bera Normality Tests

Source: Researcher, 2025

Equation	Chi2	Df	Prob > chi2
D_hort	0.891	2	0.64045
D_Inf	7.456	2	0.02404
D_Intr	0.396	2	0.82018
D_Exr	1.343	2	0.51100
D_Rainfall	0.450	2	0.79844
ALL	10.537	10	0.39473

Overall, the joint test for all variables (p-value = 0.39473) fails to reject the null hypothesis, suggesting that the VECM model as a whole does not suffer from normality issues.

Table 4. 6 Lagrange Multiplier Test for Residual Autocorrelation

Lag	Chi2	DF	Prob > chi2
1	22.8866	2	0.58418
2	17.0307	2	0.88068

Source: Researcher, 2025

The results in table 4. 6 of the Lagrange Multiplier (LM) test for residual autocorrelation indicate no autocorrelation in the residuals of the VECM model as the p-values for both Lag 1 (0.58418) and Lag 2 (0.88068) are above the 0.05 significance level.

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Multicollinearity Test

Table 4. 7 : Test for Multicollinearity

Variable	VIF	1/VIF
Exr	2.32	0.431035
Intr	1.98	0.505392
Inf	1.13	0.882510
Mean VIF	1.70	

Source: Researcher, 2025

The results presented in table 4. 7 from the Variance Inflation Factor (VIF) test indicate that multicollinearity was not a significant concern in this study. The VIF assesses the extent of collinearity among the explanatory variables, where values greater than 10 typically signal the presence of severe multicollinearity. In this analysis, all VIF values remained well below this threshold, confirming that the explanatory variables were sufficiently independent and that multicollinearity did not distort the regression estimates.

CONCLUSION

From the VECM long-run regression results, the study findings indicate that inflation had a significant negative impact (-1.4179 , $p = 0.000$) on the value of horticultural exports in Kenya. This suggests that rising inflation increases production and operational costs, thereby reducing the competitiveness of horticultural products in international markets. It also erodes farmers' purchasing power, limiting their ability to invest in quality inputs and to expand horticultural production.

The exchange rate shows a strong positive relationship (1.9724 , $p = 0.005$) with horticultural exports, meaning that currency depreciation enhances export competitiveness. A weaker Kenyan shilling makes horticultural products cheaper for foreign buyers, thus increasing demand. This finding supports the Marshall-Lerner Condition trade theory, which emphasizes the role of exchange rate adjustments in boosting exports.

Interest rates had a significant negative effect (-1.2848 , $p = 0.002$) on horticultural exports, indicating that higher borrowing costs deter investment in the sector. When interest rates rise, farmers and exporters face financial constraints, which limit their ability to expand production, adopt new technologies, or improve export logistics. Therefore, lowering interest rates could encourage growth in the value of horticultural exports in Kenya.

RECOMMENDATIONS

From the study VECM results the study offers the following policy recommendations;

Inflation Control Measures

To reduce the negative effects of inflation on horticultural exports, the government should promote price stability through monetary policies such as inflation targeting and cost-reduction strategies. Subsidizing key inputs (fertilizers, pesticides, energy) and improving storage and processing infrastructure can lower production costs and minimize post-harvest losses, helping Kenyan horticultural products remain competitively priced.

Exchange Rate Stabilization

As exchange rate depreciation positively influences horticultural exports, policymakers should adopt a managed exchange rate approach. This includes foreign exchange interventions, building reserves, and attracting FDI to ensure stability. Additionally, diversifying export destinations and securing favorable trade agreements can buffer the sector against exchange rate volatility.

Interest Rate Management for Affordable Credit

To counter the negative impact of high interest rates, the government should enhance access to affordable credit for farmers and exporters. Strengthening agricultural credit facilities, enforcing interest rate caps on loans, and expanding microfinance and cooperative lending will enable investment in productivity tools like irrigation, cold storage, and transport, thereby boosting horticultural export competitiveness.

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