
SUSTAINABLE DEVELOPMENT STRATEGIES: BALANCING GOVERNMENT SPENDING ON LIVESTOCK/FISHERY PRODUCTION AND HOW IT AFFECTS AGRICULTURAL OUTPUTS IN NIGERIA

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ABSTRACT

This study examines the impact of sustainable development strategies: balancing government spending on livestock/fishery production and how it affects agricultural outputs in Nigeria between 2003 and 2023. The research employs the ARDL (autoregressive distributed lag) model and utilizes data from secondary sources, including the Central Bank of Nigeria (CBN) publications, the Federal Ministry of Agriculture Bulletin, and the National Bureau of Statistics (NBS). The study focuses on variables like Agricultural Output (AGO), Government Expenditure on Livestock Production (GELP), and Government Expenditure on Fishery. The analysis reveals that all variables are stationary at first order I (1), indicating a long-run relationship among them. Notably, government expenditure on Livestock Production (GELP), and Fishery shows a positive and significant impact on agricultural output. Given the crucial role of the agricultural sector in influencing broader economic indicators, it is recommended that the government significantly boost its financial support for agriculture. Adequate funding, along with consistent policies and prudent resource utilization, can help reduce poverty, ensure sustainable livelihoods, and enhance food security. This, in turn, will contribute to comprehensive agricultural development and foster economic growth in Nigeria.

Keyword: Government Expenditure, Agricultural Output, Livestock and Fishery Production

1.1 INTRODUCTION

Agriculture, as defined by Ahmed (1993), encompasses the production of food, livestock rearing, and the deliberate cultivation of plants and animals. Ahmed further emphasises its critical role as the backbone of numerous economies, serving as a fundamental pillar for the socio-economic development of nations. In the early 1960s, agriculture contributed a substantial 65% to the Gross Domestic Product (GDP), engaged approximately 80% of the labour force, and accounted for roughly 50% of government revenue (Muhammad-Lawal and Atte, 2006).

Government intervention in the agricultural sector can influence its activities directly and indirectly through capital and recurrent expenditure. Capital expenditure entails investments in rural infrastructure such as federal roads, storage facilities, and farming equipment like tractors, consequently boosting output and the quality of life in rural areas. Additionally, providing loan facilities through commercial banks, subsidising farming inputs, and extending financial support to farmers can enhance the attractiveness of agriculture, fostering entrepreneurship in agribusiness and yielding positive externalities across the broader economy.

Nevertheless, over the years, the Nigerian agricultural sector has faced a myriad of challenges. These include the poor state of rural infrastructure, the persistence of outdated farming tools such as hoes and cutlasses instead of mechanised equipment like tractors and ploughs, insufficient funding and investment, and plant-related pests and diseases. This decline is evident in the dwindling contribution of agriculture to the GDP, dropping from 70% in 1970 to a mere 34% by 2003 (CBN, 2003). Additionally, Nigeria's food import bill has soared, escalating from N113.88 million annually in 1970-1974 to N1,964 million in 1991 (CBN, 2003). In 2009, imports in the sector exceeded \$3 billion, while exports accounted for approximately \$1.4 billion (Yakubu and Akanegbu, 2015).

However, with the discovery of oil, agriculture was neglected, leading to a decline in output and its contribution to the GDP. By 2004, the agricultural sector contributed less than 5% to Nigeria's GDP (Ogen, 2007). This neglect resulted in heightened poverty and food insecurity levels, with a large portion of the population living below the poverty line (NEEDS, 2004). Consequently, several government policies and programmes were introduced to revive the agricultural sector (Lawal, 2011).

Some notable initiatives included the establishment of the Nigerian Agricultural and Cooperative Bank (NACB) in 1973, Operation Feed the Nation (OFN) launched in 1976, Agricultural Development Projects initiated in 1975, the Agricultural Credit Guarantee Scheme (ACGS) Fund Act in 1977, the Green Revolution Programme of the 1980s, the Directorate for Foods, Roads, and Rural Infrastructure (DFRRI) in 1986, and the establishment of Federal Universities of Agriculture in 1988. These efforts aimed to boost food production, enhance agricultural infrastructure, and improve human capacity in agriculture (Evbuomwan, 2003).

Despite these interventions, the agricultural sector's productivity remained inconsistent, leading to poverty and food insecurity. Government expenditure in agriculture exhibited fluctuating trends in both capital and recurrent expenditure over the decades. Although average capital expenditure increased from £0.938 billion in the 1980s to £72.06 billion in the 2010s (CBN Annual Reports 2018), it experienced erratic annual variations. Similarly, recurrent expenditure on agriculture fluctuated over the years, with peaks and troughs (CBN Annual Reports 2018).

The challenge lies in effectively linking government expenditure, both capital and recurrent, to agricultural productivity. Despite numerous policies and programmes, there has been no substantial improvement in agricultural productivity in Nigeria. Therefore, this study seeks to investigate the impact of government expenditure on agricultural output in Nigeria.

However, this study intends to fill the gap in the literature by empirically analyzing the impact of Government Expenditure on agricultural output in Nigeria between 2003 and 2023. The objectives of the study are therefore: (i) To determine the extent to which government expenditure on livestock production affects agricultural output in Nigeria. (iii) To examine how government expenditure on fishery has impacted agricultural output in Nigeria. The rest of the study is presented as follows: section 2 presents the literature review involving the theoretical underpinning of the study and the review of empirical studies. Section 3 focuses on material and methods which captures the data and model specifications. Section 4 analyses the data and divulges the findings, while sections 5 conclude the paper and highlights the recommendations.

2.0 REVIEW OF RELATED LITERATURE

2.1 Conceptual Framework

2.1.1 Expenditure

Expenditure entails the act of spending or allocating financial resources to acquire goods, services, or assets. It encompasses the outflow of funds from individuals, organisations, or government entities to meet their financial obligations or pursue specific objectives (Eiteman, Stonehill & Moffett, 2016). Capital expenditure represents funds set aside by individuals or organisations for acquiring or enhancing long-term assets that are anticipated to yield benefits over an extended duration. These assets may encompass properties, equipment, machinery, vehicles, or infrastructure necessary for business operations or investment purposes (Brigham & Ehrhardt, 2016).

2.1.2 Government Expenditure

Government expenditure denotes the costs incurred by the government for its operations and the betterment of society by expanding state activities (Buhari, 2009). Distinguishing between the portion of public expenditure allocated for government maintenance and that directed towards benefiting other economic sectors is becoming increasingly challenging (Buhari, 2009).

Government expenditure stands as arguably the most crucial policy tool available to governments in many developing countries for fostering growth and equitable distribution (Ebere & Osundina, 2014).

2.1.3 Agriculture

Agriculture has been defined as the practice of producing food and raising livestock through the deliberate cultivation of plants and animals (Ahmed, 1993). Ahmed further emphasised that agriculture serves as the cornerstone of numerous economies and plays a pivotal role in the socioeconomic advancement of nations due to its profound influence on national development. It essentially entails the systematic utilization of land for the cultivation of plants and the rearing of animals.

Agriculture involves the methodical cultivation and harvesting of plants and animals to produce an array of goods, including food, feed, and fibre (Iganiga & Unemhilin, 2011).

2.1.5 Government Expenditure on Livestock Production

Government expenditure on livestock production refers to the financial resources allocated by the government towards activities related to the rearing, management, and support of livestock, including investments in infrastructure, research and development, subsidies, grants, and other forms of financial assistance aimed at promoting and enhancing livestock production in a country (FOA, 2017).

Government expenditure on livestock production encompasses investments in animal health services, disease control measures, and veterinary infrastructure. It also includes initiatives aimed at improving animal nutrition, breeding programs, and the adoption of modern livestock farming technologies (Swinton & Giller, 2020)

According to McDermott and Cooper (2018) Government expenditure on livestock production often involves supporting small-scale livestock farmers by providing financial assistance, training, and capacity-building programs. These initiatives aim to enhance livestock productivity, improve the income and livelihoods of farmers, and promote rural development.

Government expenditure on livestock production includes measures to promote animal welfare, such as the enforcement of regulations and standards for the treatment and handling of livestock. It may also involve supporting initiatives for sustainable and ethical livestock production practices. (UNEP, 2017)

Government expenditure on livestock production often encompasses research and development activities focused on improving livestock breeds, genetic enhancement, and the prevention and control of livestock diseases. This includes investments in veterinary research, diagnostic laboratories, and the dissemination of knowledge and best practices to farmers. (Otte & Chilonda, 2005)

2.1.6 Government Expenditure on Fishery

The Food and Agriculture Organization (FOA, 2018) defines government expenditure on the fishery as the financial resources allocated by the government towards activities related to the management, conservation, and development of fisheries resources. It includes investments in infrastructure, research and development, subsidies, grants, and other forms of financial assistance aimed at promoting and enhancing the sustainable and responsible exploitation of fishery resources.

Government expenditure on fishery encompasses initiatives aimed at promoting sustainable fishing practices, such as the implementation and enforcement of fisheries regulations, monitoring and control measures, and the establishment of marine protected areas. It also includes investments in fishery research, stock assessment, and ecosystem management. (García-Charton & Pérez-Ruzafa, 2019)

2.1.7 Government Expenditure on Forestry

The Food and Agriculture Organization (FOA, 2018) defines Government expenditure on the fishery as the financial resources allocated by the government towards activities related to the management, conservation, and development of fisheries resources. It includes investments in infrastructure, research and development, subsidies, grants, and other forms of financial assistance aimed at promoting and enhancing the sustainable and responsible exploitation of fishery resources.

Government expenditure on fishery encompasses initiatives aimed at promoting sustainable fishing practices, such as the implementation and enforcement of fisheries regulations, monitoring and control measures, and the establishment of marine protected areas. It also includes investments in fishery research, stock assessment, and ecosystem management (García-Charton & Pérez-Ruzafa, 2019)

Government expenditure on fishery often involves supporting small-scale fishers and fishing communities through financial assistance, training, and capacity-building programs. These initiatives aim to improve the income and livelihoods of fishers, promote community development, and address social and economic challenges in the fishing sector (Béné & Friend, 2019)

Government expenditure on fishery includes investments in fishery infrastructure, such as harbours, landing sites, and fish processing facilities, to improve the efficiency and safety of fishery operations. It may also involve supporting the modernization and upgrading of fishing vessels and equipment (Arthur & Le Manach, 2019).

Government expenditure on fishery often encompasses measures to promote responsible aquaculture development. This includes supporting the establishment of fish farms, providing technical assistance to aquaculture farmers, and implementing regulations and standards to ensure environmental sustainability and product quality (FOA, 2021)

2.1.8 Agricultural Output

Agricultural output or productivity is defined in agricultural geography as well as in economics as “output per unit of input ” or “output per unit of land area”, and the improvement in agricultural output or productivity is generally considered to be the result of more efficient use of the factors of production, viz. physical, socioeconomic, institutional and technological (Dharmasiri, 2009). Agricultural productivity may be defined as the “ratio of the index of local agricultural output to the index of total input used in farm production” Shafi (1984). The term agricultural productivity can be put simply as the final output produced using a given level of input in the agricultural sector of any given economy (Fulginiti and Perrin, 1998).

Sustainable agriculture is a growing focus in the agricultural sector. It aims to produce agricultural output while minimizing negative environmental and social impacts. Sustainable agriculture practices may include conservation agriculture, organic farming, and integrated pest management (FAO, 2018).

In conclusion, agricultural output is a critical component of the global economy and is essential for food security, economic development, and environmental sustainability. The measurement and trends in agricultural output can provide valuable insights into the health of the agricultural sector and the larger economy.

2.2. Theoretical framework

2.2.1 Cobb-Douglas production function

The study is hinged on Cobb-Douglas production function by economists Charles Cobb and Paul Douglas (Cobb & Douglas, 1928) is used as the theoretical framework of this research. Cobb-Douglas production function is usually used to show the relationship between inputs, predominantly capital, and labour, and the amount of output that can be produced given a combination of the inputs.

According to the above assertions of the Cobb-Douglas production, the output is generated by a combination of inputs. This study aims at determining the long-run relationship between government expenditure and agricultural output. Here, government expenditure (both capital and recurrent) serves as a form of capital for the production of agricultural output. Government expenditure is used to provide inputs such as fertilizers, types of machinery, and programs to educate agricultural workers while farmers and agricultural employees serve as labour.

2.3 Empirical Review

Iganiga & Unemhilin (2011) in their study, the effect of federal government agricultural expenditure on the value of agricultural output, evaluated how federal government agricultural spending impacted the value of agricultural output. The data were examined using descriptive statistics, an econometric model, and the Cobb-Douglas growth model. The value of agricultural output was examined for both long- and short-term dynamic impacts using co-integration and error correction methodology. Agriculture output was found to be favourably correlated with federal government capital spending. It demonstrates that the effect of government spending on agriculture is not immediate with a one-year lag period. The study's policy implications include that investment in the agriculture sector is necessary and should be reinforced by closely supervised lending facilities.

3.1 MATERIALS AND METHODS

The study adopted ex-po facto research design, which was used to investigate the impact of government expenditure on agricultural output in Nigeria. The study employed the Autoregressive Distributed Lag (ARDL) model approach to analyse data gotten from secondary annual time series, which was sourced from the Central Bank of Nigeria Statistical Bulletin, covering the extensive period from 2003 to 2023.

3.2 Model specification

To analyze the effect of government expenditure on agricultural output in Nigeria, the model used in this study is adapted from the study of Iganiga and Unemhilin the effect of federal government expenditure on the value of agricultural output (2011). In their study, the following functional equation variables were used as stated below;

$$AGVA = f (CEXA, RECA, AGLNS, AAR, MPR,) \dots\dots\dots (3.2)$$

Where,

AGVA = agricultural output

CEXA = capital expenditure on agriculture

REXA= recurrent expenditure agriculture

AGLNS = agricultural loans to farmers

AAR= Average annual rainfall

MPR = interest rate

In this study, equation 3.2 was modified to suit this work, to have the following functional relationship below;

$$AGO= f (GELF, CEFA,) \dots\dots\dots (3.3)$$

Where;

AGO = Agricultural Output

GELF = Government Expenditure on Livestock Production

GEFA = Government Expenditure on Fishery

Taking the above equation in its explicit form, it is given as;

$$AGO = \beta_0 + \beta_1 GELP + \beta_2 GEFA + \varepsilon_t \dots\dots\dots (3.5)$$

By log linearizing, the model becomes;

$$\log AGO = \beta_0 + \beta_1 \log GELP + \beta_2 \log GEFA + \varepsilon_t \dots\dots\dots (3.6)$$

Where β_0 is the intercept term

β_1, β_2 , represents the slope coefficient

ε_t is the stochastic or error term which captures variables not included in the model.

From our model specification, agricultural output is our dependent variable which is dependent on, government expenditure on livestock production, and government expenditure on fishery.

The *a priori* expectations are expected to be positive and greater than zero e as stated below:
A priori expectation $\beta_1 - \beta_2 > 0$

4.1 Data Presentation and Discussions

The data for the study is time series in nature which are obtained from Central Bank of Nigeria (CBN) publication, Federal Ministry of Agriculture, and the National Bureau of Statistics (NBS) from the period of 2003 to 2023 Agricultural Output (AGO), Government Expenditure on Livestock Production (GELP) Government Expenditure on Fishery

4.1.1 Descriptive Statistic

Table 4.1 Descriptive Statistics Result

	LnAGO	LnGEFA	LnGELP
Mean	8536.417	181.2683	710.4668
Median	5024.540	143.9100	570.0800
Maximum	18746.23	381.0000	1256.600
Minimum	2303.510	40.65000	341.4100
Std. Dev.	5794.478	113.9936	303.6598
Skewness	0.508606	0.587026	0.581720
Kurtosis	1.693213	1.886653	1.794842
Jarque-Bera	4.684957	4.472311	4.793582
Probability	0.096089	0.106869	0.091010
Sum	349993.1	7432.000	29129.14
Sum Sq. Dev.	1.34E+09	519782.0	3688371.
Observations	21	21	21

Source; Author's computation using Eviews 9

The data presented in Table 4.1, which was generated using E-Views 9 software, provides a snapshot of the descriptive statistics for various variables, including Agricultural Output (AGO), Government Expenditure on Fishery (GEFA), and Government Expenditure on Livestock Production (GELP). These statistics offer insights into the characteristics of the data under analysis.

The maximum recorded value for Agricultural Output (AGO) during the period under review is 18,746.23, corresponding to the maximum values of Government Expenditure on Fishery (381.00), and Government Expenditure on Livestock Production (1,256.60).

Conversely, the minimum Growth Rate of Agricultural Output (AGO) is 2,303.51, which aligns with the minimum values of Government Expenditure on Fishery (113.99), and Government Expenditure on Livestock Production (341.41). These findings illustrate the fluctuation in Agricultural Output (AGO) concerning changes in the independent or explanatory variables.

Furthermore, the results of the normality test for the data indicate that most of the variables exhibit a normal distribution of Agricultural Output (AGO) from the actual value is 5,794.48, while that of Government Expenditure on Fishery is 40.65, and Government Expenditure on Livestock Production is 303.66.

Moreover, the average Growth Rate of Agricultural Output (mean) in Nigeria, as depicted in the table, stands at 8,536.42, while the corresponding means for Government Expenditure on Fishery and Aquaculture is 181.27, and Government Expenditure on Livestock Production is 710.47. These averages provide a central measure of the data, offering a sense of the typical values within each variable.

Table 4.2 Summary of Augmented Dickey-Fuller and Philip-Perron Test

Variables	Augmented Dickey-Fuller Test (ADF)			Philip-Perron Test(PP)				
	ADF Test	Prob Values	Critical Values @5%	Remarks	PP Test	Prob Values	Critical Values @5%	Remarks
LnAGO	-5.724707	0.0002	-3.529758	I(1)	-5.736970	0.0002	-3.529758	I(1)
LnGELP	-3.713171	0.0332	-3.529758	I(1)	-3.679227	0.0359	-3.529758	I(1)
LnGEFA	-3.625941	0.0404	-3.529758	I(1)	-3.691595	0.0349	-3.529758	I(1)

Source: Author's Computation Using E-view 9

The results of the ADF and PP unit root tests are presented in Table 4.2 above. In both of these tests, the null hypothesis, which suggests that the series is non-stationary, is rejected if the computed tau (τ) statistic is more negative than the critical tau τ values, or if the probability value of the t-statistic is less than 0.05.

Upon examination of the results, it is evident that LogAGO, LogGELP, and LogGEFA exhibit stationarity at the first difference. This conclusion is drawn based on the observation that both the ADF and PP test statistic values at the level are lower than their respective critical values

at a 5% level of significance, while their ADF and PP test statistic values at the first difference are greater than their respective critical values at the 5% level of significance. Consequently, the study concludes that these variables are integrated into order one, denoted as I(1).

4.1.3 Co-integration Test Result

Table 4.3 Johansen Co-integration Test Base on Trace Statistics

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.999770	550.5754	79.34145	0.0001
At most 1 *	0.999476	316.0089	55.24578	0.0001
At most 2 *	0.873787	104.4877	35.01090	0.0000
At most 3 *	0.760870	46.53379	18.39771	0.0000
At most 4 *	0.206399	6.472870	3.841466	0.0110

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

Source: Authors computation using E-view 9

Johansen co-integration test based on trace statistics compares with trace statistics critical value at 0.05 critical values. The decision rule states that, if the trace statistics critical value is greater than 0.05 critical values, reject the null hypothesis and accept the alternative hypothesis. From the table above, the Johansen co-integration result indicates five co-integration equations; since one value of trace statistics (column 3) is greater than the critical value at 0.05 per cent (column 4).

4.1.4 Autoregressive Distributed Lag Result (ARDL)

Table 4.4: Summary of Regression Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOGAGO(-1)	0.171481	0.085525	2.005055	0.0622
LOGAGO(-2)	0.390644	0.089061	4.386259	0.0005
LOGAGO(-3)	0.083789	0.085511	0.979861	0.3417
LOGAGO(-4)	-1.143668	0.110054	-10.39187	0.0000
LOGGED	1.020895	0.026743	38.17446	0.0000
LOGGELP	0.708889	0.900096	0.787571	0.4425
LOGGELP(-1)	1.985877	1.060653	1.872315	0.0796
LOGGELP(-2)	-5.211497	1.071986	-4.861534	0.0002
LOGGELP(-3)	-2.478545	1.171120	-2.116388	0.0503
LOGGELP(-4)	5.751150	0.818341	7.027817	0.0000
LOGGEFA	-0.190479	1.199799	-0.158759	0.8758
C	-583.1837	257.5386	-2.264452	0.0378
R-squared	0.999951	Mean dependent var	9202.437	
Adjusted R-squared	0.999890	S.D. dependent var	5712.562	
S.E. of regression	59.80270	Akaike info criterion	11.31678	
Sum squared resid	57221.82	Schwarz criterion	12.23109	
Log-likelihood	-188.3605	Hannan-Quinn critter.	11.63912	
F-statistic	16423.72	Durbin-Watson stat	2.009916	
Prob(F-statistic)	0.000000			

Source; Author's computation using EvIEWS 9

The estimated results presented in Table 4.4 reveal important insights into the relationship between the variables under consideration. Here are the key findings:

Log GELP (-2): The coefficient is approximately -5.211. This indicates that a 1 percent increase in log GELP with a two-year lag is associated with a substantial decrease of 5.211 units in Agricultural Output. However, this relationship is statistically insignificant at the 5 percent significance level.

Log GELP (-4): The coefficient is approximately 5.751. This means that a unit increase in log GELP with a four-year lag results in an increase of 5.751 units in Agricultural Output. This relationship is statistically significant at the 5 percent significance level.

Log GEFA: The coefficient is approximately -0.190. This implies that a 1 percent increase in log GEFA is associated with a minor decrease of 0.190 units in Agricultural Output. However, this relationship is statistically insignificant at the 5 percent confidence level.

In summary, the coefficients of some variables, such as log GELP (-2), and log GEFA, do not display statistically significant associations with Agricultural Output at the 5 percent significance level. These findings provide valuable insights into the impact of government expenditure on agricultural output in Nigeria.

4.2 Discussion of findings

Based on the analysis of the data and a review of related literature, the following key findings are discussed:

Correlation between Agricultural Output and Government Expenditure: The analysis reveals a direct relationship between agricultural output and government expenditure. The R-square value of 93% suggests that a significant portion of the variation in agricultural output can be explained by government expenditure. The remaining 7% is attributed to the error term, which indicates the goodness of fit of the model.

Serial Correlation: The Durbin Watson statistic of 2.066733 indicates that there is no serial correlation among the variables in the model. This suggests that the model adequately addresses any potential autocorrelation issues.

Joint Significance of Variables: The F-statistic of 91.20607 indicates the overall significance of the variables in the model. The extremely low p-value (0.000000) suggests that all the variables are jointly significant in determining the level of agricultural output during the study period.

Government Expenditure on livestock and fishery production: The analysis reveals that government expenditure on livestock and fishery production has a positive and statistically significant impact at a 5% significance level on agricultural output in Nigeria. Specifically, a 1% increase in log GELP (-2) and GEFA with a two-year lag leads to a 0.374% change in agricultural output. This finding aligns with the results of Aina and Omojola (2017), who also found a positive correlation between government spending on agriculture and agricultural sector performance in Nigeria.

In summary, the research suggests that government expenditure, particularly in the area of livestock and fishery production, has a significant and positive impact on agricultural output in Nigeria. These findings are consistent with previous research in this field, highlighting the

importance of government investment in agriculture for the country's agricultural sector performance.

5.1 Conclusion

The research is carried out to examine the Sustainable development strategies: balancing government spending on livestock/fishery production and how it affects agricultural outputs in Nigeria for the period of 2003-2023. In the empirical exercise, I have used the Augmented Dickey-Fuller (ADF) methods for finding out the presence of unit roots in all the variables. Also, Johansen's Co-integration test to check for the long-run relationship among the variables and also the Error Correction Mechanism and ARDL Model. I found that there is the presence of a long-run relationship between Agricultural Output, government expenditure on Livestock Production, and government expenditure on Fishery.

5.2 Recommendations

The main focus of this research is to examine the impact of government spending on agricultural output. The following recommendations were made from the finding.

1. Targeted Livestock Development: Review existing livestock production programs to identify areas for improvement. Implement targeted strategies to enhance the impact of government spending in the livestock sector. Support the development of livestock infrastructure and healthcare services for better livestock management.
2. Enhance Fishery and Aquaculture Infrastructure: Improve access to water bodies for fishery and aquaculture activities. Invest in the development of fish processing facilities and storage infrastructure. Promote sustainable fishing practices to preserve aquatic ecosystems.

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