Journal homepage: www.fishtaxa.com

Quantifying the economic benefits of sustainable aquaculture practices in improving the production and quality of fish products: A cost-benefit analysis of a tilapia farm in Southeast Asia

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Abstract

The basic purpose of this research study is to determine the Quantifying the economic benefits of sustainable aquaculture practices in improving the production and quality of fish products. This research study depends upon secondary research data analysis for this purpose, data collected from different websites related to the economy, including web development indicators (WDI). For measuring the research study, used E-views software and generated informative results including descriptive, unit root test analysis, and the test of equality, which also present graphical analysis between them. The economic benefits included cash flow, net income, profit, and revenue; these are all considered independent variables. Sustainability aquaculture includes an ecological system; the social system is also considered independent. Improving the production and quality of fish products is the main dependent variable. The overall result found that quantifying the economic benefits of sustainable aquaculture practices shows significant and positive improving the production and quality of fish products.

Keywords: Economic benefits (EB), Net Income (NI), Revenue, Cash Flow (CF), Profit (P), Sustainability (s), Improving the production and quality (IP&Q).

Citation: Ahmad T. 2023. Quantifying the economic benefits of sustainable aquaculture practices in improving the production and quality of fish products: A cost-benefit analysis of a tilapia farm in Southeast Asia. FishTaxa 27: 13-24.

Introduction

Aquaculture Sustainability

Huge populace development after that deficiency combined with unintentional growth ended in uncontrollable growth, disregarding ecological rules, and then exiting depressing predictions used for upcoming groups (Tran et al., 2020). Main struggles rise owing to an important change of country designed for adapting paddy meadows into brackish water shrimp farms, severe gardening of finfish and shellfish, instinctive organization of shrimp fishponds, reduction of the aquatic slab, inadequate imitation procedure than making phases, discharge of pool waste lacking pre-treatment. Sustainable growth has been deliberated on as well as distinct within several methods. At least four kinds of sustainability (economic, environmental, cultural, and social) remained predictable at the world peak (Jana, 2018). Sustainable development has been well-defined by way of the organization of the group and preservation of the normal source center. Also, the nature of technical and official alteration is now in such a way as to confirm the achievement and constant approval of social requirements for current and upcoming groups. It signifies an agreement among the services of financial development also individuals of ecological defense. Jacobs named sustainable development response in contradiction of the laissez-faire economic theory that measured inhabiting sources as external to the development process, essentially infinite, inexhaustible, and free goods (Lara, 2020). Sustainability disguised

Accepted: 16 December 2022; Published: 17 February 2023

not simply extended duration financial practicality but also socioeconomic development, social harmony, conservation of natural resources, environmental safety, and biodiversity. In emerging states, sustainable aquaculture development has been combined with aquaculture actions that are concerned with near-important, low-cost fish creation to see to request of inexpensively deprived and increasing populaces (Jana & Jana, 2003). Asian combined fish cum rice construction is an instance. Naturally, the cultivated classes selected are high-value classes such as trout, shrimp, and salmon. Production is center concentrated and influenced by efforts after external the ecology of the production area an extensive variety of aquaculture practices are monitored to create both cash crops and protein. The production of protein crops by earnings of wide old undeveloped or combined rice-cum-fish culture has been the main cause of fish protein. Shrimp farming, an instance of a cash crop, has arisen newly as a significant aquaculture practice for making imported interchange in the worldwide marketplace (Reverter et al., 2021). In principle, the source of sustainable development wants to be gradually useful to decrease the option of any upcoming damage to the setting from the developed measure of aquaculture. In additional words, aquaculture systems are essential to be creative inside the, including the capability of the ecology, as well as environmentally sound, cost-effective, and socially suitable in the extended track (Zotova & Cohen, 2016).

Economic Considerations: Economic feasibility is a significant feature of sustainability. The economic feasibility of a farm relay on various economic aspects like a measure of process, credit and finance state, return cost from development, market requirement, and administration assistance assesments (Kobayashi et al., 2015). The fishing business cannot be cost-effectively feasible without effectual profitable systems, current administering elements, and substructures. The least economic extent for a farm is substantially important for efficient and sustainable organization. For sustainability, small-level aquaculture is verified effectively. In several zones, it found that the proportion of development in large-level aquatic amenities is fewer than the minor-level farm. Conversely, the growth of disseminated accommodated aquaculture, particularly of shrimp and salmonids, is significant for large-level initiatives (Ansah et al., 2014).

Production of Safe and Quality Aquaculture Products: Aquaculture is the swiftest developing source of food, and manufacturing attempts to get closer to requirements in quick rise. But, this rise has ensued in the existence of degradation and diseases in the atmosphere (Ahmed & Lorica, 2002). Farmers resorted to utilizing antibiotics as repentants to treat and avoid disease. Products and chemicals which claim to enhance soil and water and strengthen or quality of the immune system of fish and shrimp have been presented in the marketplace. Similarly, fish farmers utilize diverse varieties of food (manufactured and live), that might be polluted with hazardous zoonotic and chemical organisms. The creation of quality and safe products of aquaculture is very challenging for fish farmers, the present development is in the direction of accountable aquaculture in eco-system methods for the creation of quality and safe products of aquaculture (Hishamunda et al., 2009).

Aquaculture in Southeast Asia: The entire production of fisheries comprises productivity from capture and aquaculture fisheries, and great than tripled from 1980 - 2006. The capture fisheries persist main production resource of fish; however, an increasing resource of fish food originates from aquaculture. In 1980, from ten percent of the entire production of fisheries in Southeast Asia, the share of aquaculture raised to seventeen percent in 2000, and in 2006 it increased to twenty-seven percent. From 2006, then, greater than a quarter of entire food fish production was derived by aquaculture. Not entirely 7 states in the area are equivalently relay on aquaculture. Malaysia and Cambodia have small aquaculture areas compared to the other states and to their capture fisheries. In Cambodia and in Myanmar, in-land fisheries are significant, and aquaculture is mostly a survival (relatively than industrial) action whose main devotion is to offer feed to farming people (Little et al., 2018). It is mirrored by their dependence on complaints. Undesignated and complained fresh fish justify for

greater than eighty-five percent of its entire farmed production of fish food. Early movers like Thailand and the Philippines stimulated aquaculture in 1960 and 1970, as it offered livings (milk-fish values in the Philippines) and got overseas trade (farming of shrimp in Thailand). Livings and overseas trade remain to be core stimuli overdue administration assistance. Intensification plans for Indonesia's purposes to upsurge the rise of species, like seaweed, shrimp, grouper, and tilapia, which are intended for overseas marketplaces. Support of Malaysia for aquaculture emphasizes worldwide exported fish. Malaysia has food active and deficit assistance in aquaculture and agriculture in terms of solidifying its stability of export for Vietnam; the growth of aquaculture is nationwide important in the development of the economy and is helped for its influence on living and for overseas trade probable (Abremski & Roben, 2021; Ali et al., 2022).

Research objective:

The current report emphasizes profit-oriented or commercial aquaculture. It yields food, income, and employment. It has the capability to produce taxes for overseas trade and government by advancing economic competitiveness and efficiencies to keep the rate of aquaculture products.

This research study determines Quantifying the economic benefits of sustainable aquaculture practices in improving the production and quality of fish products: A cost-benefit analysis of a tilapia farm in Southeast Asia. This research study is divided into five specific chapters first portion represents an introduction to sustainable aquaculture practices also the quality of fish products. This section presents the research objective and also the research questions about topics. The second portion represents that the literature review also explains hypothesis development. The third portion represents that research methodology represents research tools and techniques and also that presents the theoretical and econometric model between them. The fourth section represents the results also descriptions, and the last portion summarizes the overall research study and presents some recommendations about a topic.

Research questions:

The main research question is:

How Quantifying the economic benefits of sustainable aquaculture practices in improving the production and quality of fish products?

What impact of quantifying economic benefits also that sustainable aquaculture practices related to the production and quality of fish products?

Literature review:

Research studies explained that marine ingredients contribute to the development of seafood for achieving sustainability goals.to identify that aquaculture does not negatively impact the fish stock, the fish In: Fish Out ratio is used as the principal metric.by alternating the feed ingredients with the ingredients of the marine fish meal, the FIFO ratio starts decreasing. For the species requiring higher fish oil, a higher proportion of eFIFO is required (Kok et al., 2020).studies explained that for managing aquaculture, the framework based on assessment techniques is used as a managing tool. in an eco-system, aquaculture-based activities are interlinked, and managing these interlinked activities is done through an assessment framework. studies revealed that many assessment frameworks negatively impact aquaculture by changing its production modes. but the positive impacts of an ecosystem-based assessment framework are far more than its negative impacts on aquaculture. The positive impacts of the ES assessment framework on aquaculture include improving the services management system of aquaculture. using ES-based assessment techniques in marine management systems improves the chances of developing sustainable aquaculture (Custódio et al., 2020). Studies show that food security is directly or indirectly gets influenced by aquaculture techniques. A modest amount of greenhouse gas is emitted from several aquacultures. The low emission value of the greenhouse from

aquaculture results in lower consumption of feed and a higher fertility ratio in finfish (MacLeod et al., 2020).studies claim that the use of plant-based supplements for treating fish diseases and for increasing fish immunity is used widely .theses plant base supplement helps in improving the resources of aquaculture.studies explain that plastic pollution caused due to aquaculture damages marine life. To ensure the safe disposal of litter from aquaculture, various litter management system base frameworks are used in the field of aquaculture (Skirtun et al., 2022).studies predicted that aquaculture plays a critical role in maintaining the gross domestic product value. The understanding of the importance of aquaculture in improving gross value highlights its role in maintaining economic stability (Cai et al., 2019).studies claim that aquaculture is the main driver behind deforestation and other land-related changes'. To ensure the sustainability of the environment and to maintain the eco-system of Mangroves, various changes have been made in aquaculture policies. The new policies of aquaculture increase the mangrove ecosystem and its activities (Lukman et al., 2021).studies explained that most aquatic food sources are in aquaculture (Regueiro et al., 2022).studies claim that the agriculture field faces feeding problems due to an immense increase in population that result in the emergence of negative impacts on the environment. By dealing with the challenges faced by the agriculture field sustainability is achieved (Su et al., 2020).studies show that in fulfilling the seafood demand, aquaculture plays a crucial role. To improve the production value of seafood through aquaculture and to minimize aquaculture waste, sustainable aquaculture practices are used in the management system. The use of biofilters for removing aquaculture wastes improves the stability of aquacultures. various techniques are used in aquaculture to increase the efficiency of the aquaculture sector .theses techniques include the Recirculating Aquaculture Technique and Product Storage Methodologies (Campanati et al., 2022).studies show that sustainable development of the aquaculture industry is achieved through integrated aquaculture-related practices’. The process of specie diversification holds ecological importance in enforcing aquaculture-based strategies (Kim et al., 2022).studies predicted that in most countries, the level of water consumption by aquaculture is high. This water consumption process allows aquaculture to develop quality products that play a part in maintaining the sustainability of aquaculture (Jiang et al., 2022).studies revealed that the aquaculture energy synthesis process provides potential applications. Various methodologies are used in the agricultural field to increase the production of energy in aquaculture industries. the high energy synthesis then provides more commercial benefits to the aquaculture industry (David et al., 2021).studies claim that for the production of aquaculture products, the farming technique OF MANILA CLAM is used in the agriculture field. The carbon sink used in Manila clam farming helps in fixing nitrogen, thereby decreasing the chances of environmental pollution due to the aquaculture process (Turolla et al., 2020).studies claim that for maintaining sustainable aquatic food production the aquaculture environmentally friendly techniques are used in the aquaculture process. To increase the global aquaculture production and aquatic food production rate, technical as well as institutional-based methodologies are employed (Henriksson et al., 2021).studies revealed that the products of aquaculture have lower carbon footprint value in comparison to other livestock products. the low carbon footprint provides economic benefits to aquaculture .also; aquacultures are efficient in producing energy using low-carbon technology systems for maintaining the overall sustainability factor associated with aquaculture industries (Tsakiridis et al., 2020).scholars explained that using optimized and decision-making strategies in aquaculture makes its working more organized and efficient. the quality of the product improves when developed using optimized strategies in the aquaculture industry. The feeding strategies adopted in seabream aquaculture industries work on the decision-making methods for maintaining environmental stability (Luna et al., 2019).studies claim that the increase in ice lice pressure due to salmon farming impact environmental conditions. The ice lice issue is the main cause that affects salmonoid-based aquaculture. The information about the ice lice is obtained using the life cycle assessment method (Somasundaram et al., 2021). For treating

salmon aquaculture-based problems, biological treatments are used in salmon aquacultures (Philis et al., 2022).studies show that aquaculture causes environmental degradation by producing marine litter. This problem is solved through the European Atlantic area projects that work by supporting the seafood sector's stability value. The European project boosts the process of eco-innovation and helps in developing Eco based products (Laso et al., 2022).studies highlighted that using the proteomic strategies helps in evaluating the farming impacts on seafood quality. almost forty-seven percent of fish production is due to aquaculture activities (Carrera et al., 2020).studies explained that operational alternations in the aquaculture field results in the production of sustainable seafood. the production outcomes increased the sustainability value associated with aquaculture. The reduction in the usage of land and freshwater resources improves feed management-related practices. The sustainable increases in aquaculture practices help in overcoming the increased demand for seafood and protein. Moreover, The demand for marine feed is managed using aquaculture's eco-friendly methods in aquaculture industries (Boyd et al., 2020).

Hypothesis development:

H0= There is not any effect between Quantifying the economic benefits related to sustainable aquaculture practices in improving the production and quality of fish products.

H1= There is a positive and significant impact of quantifying the economic benefits and sustainable aquaculture practices for improving the production and quality of fish products.

H2= There are negative but significant effects of quantifying the economic benefits and sustainable aquaculture practices for improving the production and quality of fish products.

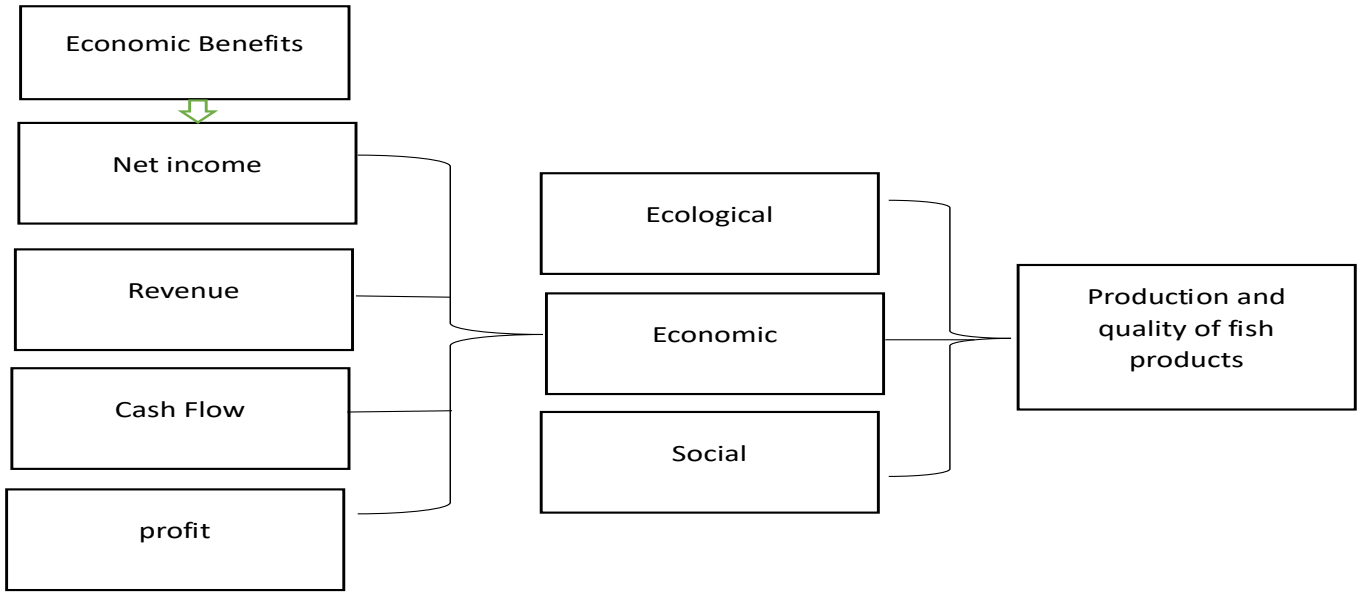
Research methodology:

The research is based on quantifying the economic benefits and sustainable aquaculture practices for improving the production and quality of fish products. This research study depends upon the secondary research data analysis related to the economic benefits and sustainability of aquaculture practices. The economic benefits included net income, revenues, cash flow, and profit; these are all considered independent variables the sustainability, including ecological factors and social factors also that economic these are all also considered as independent. The production and quality of fish products is the main dependent variable for determining the relationship between them.

Research Tools and Techniques:

The research study was based on secondary data analysis to determine whether the research study used E-views software and generated selective results related to the variables. For this purpose gathered, data from different websites included world development indicators also that these data convert into ratios form for determine the study between them. The descriptive statistic analysis, the correlation coefficient, the total equality test, the unit root test analysis, and the cointegration analysis also explain the graphical test analysis for measuring the findings related to the production and quality of fish products.

Theoretical Framework:



Economic benefits: Any advantage that can be quantified in terms of money is termed an economic advancement. Net income and revenues are two scenarios of monetary gains. Profit and net cash flow are also economic improvements. A discount on such a cost can also be beneficial economically. Economic benefits include lower labor and raw material costs, for example. People who study economics can also better understand their environment. It helps people understand others, organizations, markets, and management, allowing them to respond more efficiently to the difficulties and opportunities that ensue as conditions change. Economics majors are well-suited for a variety of profession paths because of their aptitude for problem-solving and data analysis, including law, risk management, actuarial work, finance, international affairs, government administration, politics, policy assessment, healthcare management, entrepreneurship, market research, writing, and as however unknown fields. The breadth and flexibility of an economics degree enable students to respond to unanticipated changes and take opportunities.

Net incomes: Net income is the amount that an individual or business makes after expenses, reimbursements, and taxes. A company's net income is the amount left over after expenditures like salaries and wages, the price of goods or raw materials, and taxes. A person's "take-home" pay after deductions for taxes, health insurance, and retirement is their net income. To be obvious, net income should be more than spending on financial health. A company that generates net profits adds value. As a result, in a competitive market, only businesses that continuously generate net income can survive. The cash situation of a company is not necessarily reflected in net profits.

Revenue: In economics, revenue refers to a company's income from selling an item or service to its clients. According to technical standards, income is determined by dividing the cost of the item (p) by the amount produced and sold (q). Revenue (R) is defined algebraically as R = p q., the process through which taxes on economic activity produce the income needed to fund government functions. The main justification for governments taxing citizens is the financial effect. Your strategy for increasing revenue is what it means to have a revenue strategy. Both short-term (like improving your sales incentive plan) and long-term (like placing more of a strategic emphasis on customer retention) solutions should be a part of your revenue strategy.

Cash flow: The inflow and outflow of capital inside a business are called cash flow. Inflows are expressed by cash received, whereas outflows are represented by cash spent. A cash flow statement is a form of financial

statement that describes a company's cash sources and uses over time. One of the essential goals of financial reporting is to evaluate the quantity, timeliness, and unexpected character of cash flows and their origins and destinations. It is essential to measuring an organization's liquidity, flexibility, and overall financial success. Positive cash flow indicates that a company's liquid assets are growing, allowing it to meet commitments, invest in its business, distribute earnings to shareholders, pay costs, and provide a safety net during looming financial difficulties. Businesses that have considerable financial flexibility can profit from investments.

Sustainability: Sustainability may be described as the capability to incessantly sustain or maintain a process. In commercial and governmental circumstances, sustainability strives to halt the reduction of natural or physical resources in order to make them obtainable in the long term. As a result, sustainable policies place a major emphasis on how a certain policy or company's practice will affect people, ecosystems, and the general economy in the long term. The concept typically refers to the hypothesis that if major changes are not made to the earth's management, irreparable devastation will result. As concerns about human climate change, biodiversity loss, and contamination have grown, the globe has adopted sustainable practices and policies. Sustainability refers to our civilization's ability to endure and expand while not depleting all of the natural resources necessary for future generations to live. Sustainable development, which includes frameworks, methods, and local, national, and international aid, contributes to this long-term goal.

Production and quality of fish products: Quality assurance of the finished product depends significantly on the proper treatment of fish between capture and delivery to the consumer. Quality criteria include handling techniques, fish-holding times and temperatures, and cleanliness standards. With a few rare exceptions, fish are regarded as being pathogen-free when they are initially caught. Bacteria that are dangerous to humans typically imply inadequate handling and processing cleanliness, and the contamination is virtually invariably either human or animal origin. Salmonella has been discovered in fish cleaned in contaminated water and fish holds. Contamination might occur when the fish are gutted at the quayside in a filthy harbor. Shrimp are sun-dried at the landing site in several BOBP nations, making them highly susceptible to animal and bird waste contamination. Sun-dried materials are known to have a lot of salmonellae.

Results and descriptions:

Descriptive statistic:

Table-1

	EB	NI	R	CF	P	ECO	SO	PQ
Mean	3.259202	2.449107	1.793230	1.893598	2.658607	1.521854	2.632507	2.756502
Median	2.783050	1.620415	1.874400	1.900220	2.346855	1.422500	2.402900	2.591500
Maximum	8.765400	9.887600	3.209800	3.786400	4.356200	1.999200	4.894300	4.389200
Minimum	1.111300	1.098700	1.098100	1.123400	1.234100	1.123100	0.983200	1.347800
Std. Dev.	1.967869	2.288908	0.581051	0.533857	1.101404	0.311824	1.184892	0.830843
Skewness	1.079013	2.420775	0.891439	1.610442	0.264592	0.324494	0.276134	0.164549
Kurtosis	3.667514	7.798116	3.201322	7.834355	1.695156	1.409293	1.858544	2.357548
Jarque-Bera	5.102653	46.46253	3.219184	33.74508	1.982653	2.951533	1.607922	0.521050
Probability	0.077978	0.000000	0.199969	0.000000	0.371084	0.228603	0.447553	0.770647
Sum	78.22085	58.77856	43.03751	45.44634	63.80657	36.52450	63.18016	66.15604
Sum Sq. Dev.	89.06773	120.4993	7.765278	6.555085	27.90109	2.236380	32.29130	15.87690
Observations	24	24	24	24	24	24	24	24

The results of the descriptive statistic analysis described above The output represents the mean, median, standard deviation, skewness, likelihood, and a sum of square deviation values of each variable for determining the Quantifying the economic advantages of sustainable aquaculture practices in enhancing fish product production and quality. The results show that economic gain is the dominant independent variable, with a mean value of 3.25 and a median value of 2.78. 1.96 is the standard deviation rate. Its probability value of 0.077 indicates that there is a 7% difference between them. According to the results, the sum of the square

deviation rate is 89.06773 and its sum value is 78.220. The total number of observations utilized for measuring the analysis is 24. Net income is a subset of economic benefit, with a mean value of 2.449. The overall probability value of 0.000 indicates a positive average value of mean and a 100% degree of significance between them. The result represents that sum of the square deviation is 120.499; the standard deviation value present that 2.28 deviate from the mean values. According to the result, the revenue is also a subpart of economic benefits result presents that the significant value is 0.199, showing that there is a 19% significant level between them; the average mean value of revenue is 1.79 respectively. Similarly, the cash flow and profit are also considered independent variables and its part of the economic benefits; according to the result, their mean value is 1.89, and 2.65 shows positive rates. The result presents that the probability value is 0.000 0.37, showing 100% and 37% significant levels between them. The result describes that the sum of square deviation presents 6.555 and 27.901; all value shows that the positive sum of square deviates rates between them.

Unit Root Test Analysis:

Null Hypothesis: EB has a unit root
Exogenous: Constant
Leg Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.504000	0.1275
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

The preceding results summarise the unit root test analysis, and the t statistic and probability values are shown. The enhanced dickey-fuller test statistic reveals that the t value is -2.504 and the probability value is 0.12. This is negative, yet there is a 12% difference between them. According to the results, its 1%, 5%, and 10% level statistics are -3.75, -2.998, and -2.6387, respectively, indicating negative values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EB)
Method: Least Squares
Sample (adjusted): 2 24
Included observations: 23 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
EB(-1)	-0.481994	0.192489	-2.504000	0.0206
C	1.562878	0.743093	2.103208	0.0477
R-squared	0.229923	Mean dependent var		-0.053024
Adjusted R-squared	0.193253	SD dependent var		1.967188
SE of regression	1.766910	Akaike info criterion		4.059283
Sum squared resid	65.56142	Schwarz criterion		4.158022
Log-likelihood	-44.68176	Hannan-Quinn criteria.		4.084116
F-statistic	6.270016	Durbin-Watson stat		1.664373
Prob(F-statistic)	**0.020599**			

The following result reflects the enhanced dickey-fuller test equation result, which describes the coefficient values, standard error, t statistic values, and economic benefit probability values. The coefficient is -0.48, the standard error is 0.19, and the t-statistic is 2.103. Also, the probability value of 0.04 indicates that the relationship between Quantifying the economic advantages of sustainable aquaculture practices in enhancing the output and quality of fish products is positive and 100% significant. According to the result, its R square value is 0.22 showing a 22% research model fit for measuring the relation; the adjusted R square value is 0.19, and the overall significant value is 0.02 showing that 2% mean 100% significant level between economic benefits and improving the production and quality of fish products. The result also describes that the standard error regression value its rate is 1.7669, the sum squared value is 65.56, and its F statistic value is 6.27,

respectively.

Null Hypothesis: EB is a martingale
Sample: 1 25
Lags specified as a grid: min=2, max=16, step=1

Joint Tests		Value	df	Probability
Max |z| (at period 11)*		1.144488	23	0.9873
Individual Tests				
Period	**Var. Ratio**	**Std. Error**	**z-Statistic**	**Probability**
2	1.029688	0.205273	0.144626	0.8850
3	0.870889	0.348611	-0.370357	0.7111
4	0.828035	0.449617	-0.382470	0.7021
5	0.773038	0.517204	-0.438825	0.6608
6	0.700029	0.566385	-0.529624	0.5964
7	0.575280	0.606432	-0.700359	0.4837
8	0.314201	0.641591	-1.068903	0.2851
9	0.240428	0.674286	-1.126482	0.2600
10	0.223072	0.705410	-1.101384	0.2707
11	0.159509	0.734381	-1.144488	0.2524
12	0.165739	0.761154	-1.096047	0.2731
13	0.243079	0.785852	-0.963185	0.3355
14	0.342838	0.808608	-0.812708	0.4164
15	0.513081	0.829678	-0.586877	0.5573
16	0.526571	0.849245	-0.557470	0.5772

***Probability approximation using studentized maximum modulus with parameter value 15 and infinite degrees of freedom**

The above result describes the variance ratio analysis related to economic benefits. Also, the sustainability of the result represents the variance ratio analysis, the standard error, the z-statistic values, and also the probability values. The result represents that joint tests and individual test analysis the result represents value is 1.144 its probability rate is 0.98 showing that there is a 98% significant level between them. The result represents that individual test analysis results describe variance ratios are 0.16, 0.24, 0.22, 0.15, 0.165, 0.513, 0.526; all values show that 16%, 24%, 51%, and 52% rates of variance ratios related to the dependent and also independent. According to the result, its standard error values are 0.73, 0.78, 0.82, 0.84, 0.73, and 0.56; all values represent positive errors of the mean values. The result describes that z statistic rates present negative values also that probability values are 0.48, 0.28, 0.27, 0.33, showing 27%, 33%, 41%, 55%, and 57%; all values present significant levels between them. The result also describes that probability approximation by using the studentized models included cost benefits analysis between them.

Equality Test Analysis:

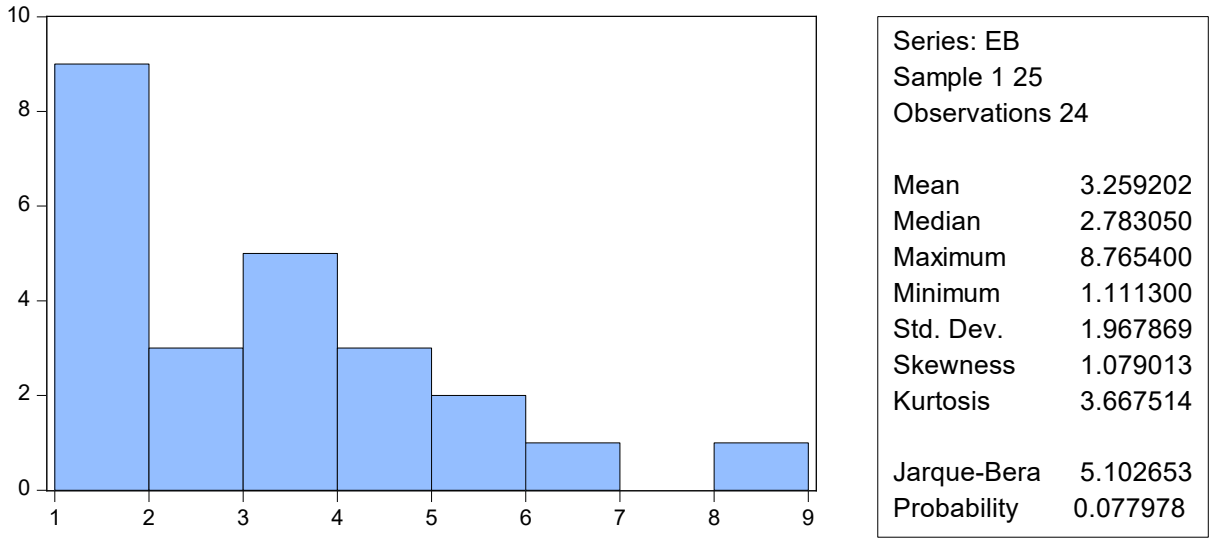
Test for Equality of Means of EB
Categorized by values of EB and NI and R and CF and P and ECO and SO and PQ
Date: 04/16/23 Time: 02:44
Sample (adjusted): 1 24
Included observations: 24 after adjustments

Method	df	Value	Probability
Anova F-test	(22, 1)	19.13986	0.1787
Analysis of Variance			
Source of Variation	**df**	**A sum of Sq.**	**Mean Sq.**
Between	22	88.85671	4.038941
Within	1	0.211023	0.211023
Total	23	89.06773	3.872510

The above result represents that test of equality result describe the value and probability values; this result

represents that the ANOVA F test methods value is 19.1398 its probability value is 0.17, showing that positive and 17% significant level between the Quantifying the economic benefits of sustainable aquaculture practices in improving the production and quality of fish products. The result also describes the source of variance between and within also total methods; its value of a sum of a square is 88.85, 0.2110, and 89.0677, showing that positive sum of square values. The mean square value is 4.038, 0.21, and 3.87; all values present the positive average value of the square related to them. According to the result, total equality presents a significant relationship between them.

Histogram and state analysis:



The above graph depicts the histogram, and the state analysis result depicts the graphical analysis. The blue bar line represents the histogram connected to economic gains and enhancing fish productivity and quality. The vertical side displays the frequency level, which begins at 0 and ends at 10 points, while the horizontal side displays the range between 1 and 9. As a consequence, the mean value is 3.25, and the median rate is 2.78. The standard deviation rate is 1.96, and the probability value is 0.077, indicating that there is a 7% difference between them. The result indicates that the skewness value is 1.07. The greatest and minimum values are 8.76 and 1.111, respectively.

Conclusion:

This research study describes the Quantifying economic benefits of sustainable aquaculture practices in improving the production and quality of fish products. This research study is based on secondary research analysis and also a theory-based analysis to determine the research study used E-views software and generated informative results. The unit root test analysis, histogram, and state analysis, the variance ratio analysis also that present descriptive statistic analysis between them. The overall research study concluded that there are positive and significant economic benefits of sustainable aquaculture practices for improving the production and quality of fish products. This research study accepts all alternative hypothesis and rejects the null hypothesis there are a direct relationship between economic benefits and improving production and quality of fish products. . The approaches used in the aquaculture study explain that producing aquatic food sources and maintaining sustainability factors by aquaculture is a complex process. Using the EU aquaculture principles in its regulatory-based framework system provides great opportunities as well as limitations in the field of aquaculture.

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