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Evaluation of Pakistan's Fisheries Production as Compared to Other Countries: A Grey Relational Analysis

Tehmina Fiaz Qazi
Hailey College of Banking and Finance, University of the Punjab, Lahore, Pakistan, tehmina.qazi@gmail.com
Abdul Aziz Khan Niazi
Department of Management Sciences, University of Engineering and Technology, Lahore, Pakistan, azizniazi@uet.edu.pk
Areeba Aurangzaib
Department of Management Sciences, University of Engineering and Technology, Lahore, Pakistan
Hira Mushtaq
Department of Management Sciences, University of Engineering and Technology, Lahore, Pakistan
Zaraksha Rashid
Department of Management Sciences, University of Engineering and Technology, Lahore, Pakistan
Husna Mojdin
Department of Management Sciences, University of Engineering and Technology, Lahore, Pakistan
Hiba Qamar
Department of Management Sciences, University of Engineering and Technology, Lahore, Pakistan
Amna Jamil
Department of Management Sciences, University of Engineering and Technology, Lahore, Pakistan

Abstract

The production of fisheries worldwide is examined in this research study, with an emphasis on the social, environmental, and economic aspects of this important sector. For millions of people globally, fisheries provide food and a living. They are therefore essential to food security. In order to determine changes in catch quantities, species diversity, and the effects of overfishing and climate change, the research analyses data from several regions. In order to secure the long- term sustainability of fishing resources, it also examines sustainable practices and regulations. Therefore, the aim of this study is to evaluate the production of fisheries of Pakistan against the world using Grey Relational Analysis (GRA). The design of this study is literature review, data acquisition, and analysis. Population understudy is all sovereign countries of the world. The study is envisaged on the data of total almost all countries of the world. The data is obtained from World Development Indicators (WDI). Techniques of analysis employed is GRA. Pakistan holds an excellent rank among the countries in terms of fisheries' production. It is an original study based on accurate dataset, employing a unique analysis model, and provides lot of new insights to a wide range of stakeholders as it contributes gray relational coefficient, gray relational grades and gray relational ranks as against each country.

Keywords: Aqua Culture, Production of Fisheries, Pakistan Fisheries, GRA

Introduction

The fisheries sector plays an important role in global economic development, food security, and ecological sustainability (Ali & Rehman, 2015; Ali et al., 2020). As one of the primary sources of protein for billions of people worldwide, fisheries not only support livelihoods but also contribute significantly to national economies (Pillay & Kutty, 1990). However, this vital industry faces numerous challenges, including overfishing, habitat degradation, and the impacts of climate change, which threaten its sustainability and the ecosystems it relies on (Kayalvizhi et al., 2015; Ali & Zulfiqar, 2018; Ismail & Saeed, 2019). In recent years, the need for effective management strategies has become increasingly apparent, necessitating a comprehensive understanding of fisheries dynamics across different regions (Gray, 2010; Salleh & Sapengin, 2023). It is evergreen area for research particularly at country level. The comparative analysis of the countries is one of the norms of econometric research. Countries are compared with each other on the basis of a wide variety of economic variables since production of fisheries is one of the very vital economic indicators therefore it also necessitates to be used for comparison of the countries. Pakistan is one of the important producers of fisheries and it is imperative to determine the position of Pakistan in terms of fisheries as compared to the rest of the world. Although the production of fisheries has paramount importance for an economy but it is relatively less studied area.one can hardly find a research study focusing on comparative analysis of the countries on the basis of fisheries production. The authors could not find any study that compares that Pakistan with that of other producers of fisheries using any modern technique of comparative analysis. There is a dire need of comparing Pakistan with other countries on objective basis. Therefore, the objective of the study is to compare Pakistan's fisheries production with that of other countries of the world. The study considered a wide range of methodological choices for achieving objectives of the study. In methodological choices, the authors find seven options viz TOPSIS, VIKOR, SWARA, MOORA, AHP & GRA. GRA is found to be the most appropriate keeping in view the objective of the study.

This method is very popular and helpful to address the issues of ranking the alternatives on the basis of multitude of criteria viz Basit, et al., 2019; Basit, Qazi & Khan 2021; Naeem, Muhammad & Niazi, 2021; Niazi, Qazi, & Basit, 2021; Qazi, et al., 2020 and Qazi, et al., 2021b. Grey analysis, a quantitative method that focuses on the uncertainty and variability of systems, offers a robust framework for examining the complexities of the phenomenon (Tabassum et al., 2016). By analyzing data on catch levels, species diversity, and environmental conditions, gray analysis allows for the identification of patterns and trends that can inform better decision-making processes (Nelson, 2006) This research paper aims to apply gray analysis (Wei, 2011) to the fisheries of various regions around the world, highlighting key findings and insights that can contribute to more sustainable practices (Khan & Ali,2021). Through a comparative assessment of fisheries data

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(Ali, Khan, & Hussain, 2020; Bilal & Tanveer, 2023) we seek to uncover the underlying factors influencing fish populations and ecosystems, providing a valuable resource for policymakers, researchers, and practitioners in the field (Khan & Ullah, 2020; Abid & Noor, 2021). By enhancing our understanding of global fisheries, this study aspires to promote sustainable management practices that ensure the long-term viability of fish stocks and the communities that depend upon them (Adeel & Raza,2022). Remaining part of the study is represented as literature review (section 2), methodology (section 3), data collection/analysis/discussion (section 4) and conclusion (section 5).

Literature Review

It is imperative to review the literature particularly to avoid any unnecessary duplication therefore the authors have reviewed the contemporary literature on comparing the economies on the basis of fisheries. The authors have explored all major research data basis for example Elsevier (ScienceDirect), Emarald Insights, JStor, Willy Blackwell, Taylor & Francis, Sage Open, Ebschost, MDPI, Frontiers, etc. The feature of advance search of these databases is used on google as search engine. The key words for search include fisheries production in Pakistan, comparative analysis of fisheries, fishing and fisheries, countries leading in fisheries production, role of fishing and fisheries in economies etc. The search resulted in hundreds of research articles covering different aspects of fishing and fisheries production world over. The authors reviewed broad range of literature. Some of the research articles that are found to be highly relevant to the context of the study are reported in this section to set the very outset of the current study. The fishing industry is essential to Pakistan's economy since it creates jobs and ensures food security (Raza & Hussain, 2021). Comparing the sector's output levels and processes to international standards, however, reveals significant obstacles. This assessment of the literature summarizes recent findings to assess Pakistan's fisheries output in a worldwide framework (Ahmed & Khan, 2020). Pakistan's

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fishing industry, which include both marine and inland fisheries, is mostly centered on the Arabian Sea. Pakistan is one of the top producers of fish, according to the Food and Agriculture Organization (FAO, 2022). However, its output levels are erratic and frequently insufficient to satisfy demand both domestically and internationally (Khan, Shakir & Abbas, 2019). Numerous studies show that the sector's potential is hampered by overfishing and poor management techniques (Khan et al., 2019; Ali et al., 2020).

However, Pakistan's fisheries have not yet fully incorporated these methods, which has led to decreased competitiveness and production (Kabir & Rashid, 2019; Zafar & Ali, 2020; Cooper, 2022; Lee & Hur, 2022). A number of problems prevent Pakistan's fisheries from expanding (Hossain & Haque,2021). Estimates indicate that major reductions in important fish stocks have resulted from overfishing, which is still a severe problem (Bashir et al., 2021). Aquatic ecosystems are more vulnerable to environmental degradation, which is made worse by pollution and climate change (Ahmed & Qureshi, 2020). Pakistani fish's capacity to compete on the international market is further hindered by a lackluster infrastructure for distribution and processing (Rahman et al., 2021; Yang & Ron, 2022). Research shows that Pakistan's fish production is significantly less efficient than that of leading countries. Jabeen & Ali (2022) asserted that highlight the technological gaps in aquaculture practices, emphasizing that countries with advanced aquaculture techniques achieve significantly higher outputs. The absence of governmental support for research and development further exacerbates these inefficiencies (Siddiqui et al., 2022; Feng & Qi, 2024). Pakistan must accept more stable practices to improve the fish agricultural sector. An international example shows the participation of the community in the effectiveness of the normative framework and the stimulus of stability (Ahmed & Rehman, 2019; Memon et al.,2023). Implementing best practices in habitat restoration and fish stock management could enhance the viability of fisheries in

Pakistan and align them more closely with global standards (World Wildlife Fund, 2023). Although there is influx of research studies but the authors could not find any research article that compares the countries on the basis of fisheries production despite of the fact that fisheries are one of the vital building blocks of food and it deserves high degree of research attention. There is dire need of studies in this context.

Methodology

The study follows positivism as research philosophy, deductive approach and grey systems theory as methodological approach as used in Basit, Qazi, & Niazi, 2020b; Qazi, Niazi, & Basit, 2021; Niazi, at al., 2021a; Basit, Khan, & Qazi, 2021 and Qazi, Niazi, & Inam, 2019). This study uses secondary data retrieved from WDI. It is a cross-sectional study that uses the country level data set for the year 2022 (as available on the website of aforementioned source) on fisheries production. It uses Grey Incidence Analysis model (which is commonly known as Grey Relational Analysis or imply GRA), a proprietary mathematical approach selected from a range of multi-criteria decision-making methods. In this model, the first step is obtaining the data, the second is creating a reference series, the third is creating a normalization matrix from the original data, the fourth is creating a deviation sequence of the reference series (creating absolute values by the difference between the comparable sequence and reference sequence), the fifth is creating a table of gray relation coefficients, the sixth is calculating the grey relation grade, and the seventh is creating a ranking around the world by the data (Ali & Noor,2022). This method was augmented by classifying of the cross-section using the ensign method (Basit, Qazi, & Niazi, 2020b; Qazi, Niazi, & Basit, 2021). In this method, first, an operational definition of the ensign group was generated based on distributing the scale to the four ensigns then set a range for each ensign so that countries are divided among excellent to poor on the basis of grades and this helps to categorized countries on the basis of their gray relational grade and ranks. From total 213 countries the data available in the production of fisheries of Pakistan against World is 183 countries so we have used the data of 183 countries. We have taken the data from (WDI) World Development Indicator, and the technique we have used is grey relational analysis (GRA).

Applying Grey Incidence Analysis Model

Mathematical Representation of GRA: The follows stepwise procedure and mathematical algorithm as used in Basit, et al., 2021; Basit, Qazi, & Niazi, 2020a; Niazi, et al., 2021b; Qazi, et al. 2021a; and Rashid, et al., 2021. The following steps of GRA were used to access the performance among different countries of the world

Step 1: The authors have created a data set and established a matrix of data set denoted in the following formula

$$x_i(k) = \begin{bmatrix} x_1(1)x_1(2)\ldots x_1(m) \\ \vdots \ddots \vdots \\ x_n(1)x_n(2)\cdots x_n(m) \end{bmatrix} \qquad (1)$$

Step 2: The authors have created a reference series and comparison matrix Table 3 using a classical rule of Reference and comparison.

Step 3: The authors have created a normalized matrix Table 3 by using the formula for maximum better and minimum better and all the variables are maximum better so we use eq.2. to normalize the data.

For maximum better

$$x_i^*(k) = \frac{max\, x_i^{(0)}(k) - x_i^{(0)}(k)}{max\, x_i^{(0)}(k) - min\, x_i^{(0)}(k)} \qquad (2)$$

For minimum better

$$x_i^*(1) = \frac{max\, x_1^0(1) - x_1^0(1)}{max\, x_1^0(1) - min\, x_1^0(1)} \qquad (3)$$

Step 4: we have calculated deviation sequences Table 4 by using the formula

$$\Delta_0(\gamma) = |x_0(\gamma) - x_1(\gamma)| \qquad (4)$$

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Step 5: The grey relational co-efficient is calculated Table 6 by using the following formula on the basis of values of normalized sequence term ξ is used as the distinguisher among 0 and 1.

$$\gamma[x_0^*(k), x_i^*(k)] = \frac{\Delta_{min}+\xi\Delta_{max}}{x_{0i}(k)+\xi\Delta_{max}}, 0, < \gamma[x_0^*(k), x_i^*(k)] \quad (5)$$

Step 6: The weighted sum of Grey relational co-efficient, grey relational grade Table 7 is calculated by using the following formula

$$\gamma(x_0^*, x_i^*) = \sum_{k=1}^{n} \beta_k \, \gamma[x_0^*(k), x_i^*(k)] \quad (6)$$

$$\sum_{k=1}^{n} \beta_k = 1$$

Step 7: The Countries are categorized on the basis of their grade from Table 7 we prepare Table 8 the ranks of the countries by using the ranks formula in excel which will be provided on demand beside this document. An excel sheet will be provided separately so it is easy to understand the calculations.

Step 8: Table 9 are prepared by using ensigns to classify each country on the basis of grades and ranks readers will find it interesting and easy to read the results in this way altogether there are total 183 countries are in this data and all are ranked and their grades are different from each other

Applying GRA: The authors have evaluated the three selected variables and found them to be beneficial criteria therefore all the variables are maximum the better (Table 1).

Table 1: Specification of System Variables

Code	Variables	Criteria
1	Aqua culture production	Maximum Better
2	Production of fisheries (metrics ton)	Maximum Better
3	Capture fisheries production (metrics ton)	Maximum Better

From the Table 1 it can be observed that all the three variables listed at 1-3 are maximum acceptable. The data obtained from WDI is represented as Table 2 (skip

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Table) however the complete dataset is available with authors and it can be obtained on request.

Table 2: Original Dataset

Sr.	Country	1	2	3
1	Afghanistan	11150	13150	2000
2	Albania	8812	17552	8740
…	…	…	…	…
…	…	…	…	…
131	Peru	140931	5509031	5368101
132	Philippines	2349252	4120499	1771247
133	Poland	46110	224633	178523
…	…	…	…	…
…	…	…	…	…
182	Zambia	75648	185076	109428
183	Zimbabwe	8353	34514	26161

Therefore, for normalization of the data (Table 3) formula 2 is used. Since, all the indicators are maximum better, therefore, the authors use to find out what is the maximum value (Table 3). The referred value is written at the top of the table and the row named as reference sequence. Minimum value is also given for subsequent use in mathematical formula.

Table 3: Normalize Comparable Sequence

Sr.	Country	1	2	3
0	Reference Sequence	1.0000	1.0000	1.0000
1	Afghanistan	0.0001	0.0001	0.0002
2	Albania	0.0001	0.0002	0.0007
…	…	…	…	…
…	…	…	…	…
131	Peru	0.0019	0.0622	0.4073

132	Philippines	0.0312	0.0465	0.1344
133	Poland	0.0006	0.0025	0.0135
…	…	…	…	…
…	…	…	…	…
182	Zambia	0.0010	0.0021	0.0083
183	Zimbabwe	0.0001	0.0004	0.0020

Normalized values are obtained by using the formula 2. For instance, indicator 1 of Afghanistan would be solved in this way.

$$x_i{}^*(1) = \frac{max\, x_i{}^{(0)}(k) - x_i{}^{(0)}\,(k)}{max\, x_i{}^{(0)}(k) - min\, x_i{}^{(0)}(k)} = \frac{11150-0}{75388639-0} = 0.0001$$

The deviation sequence (Table 4) is generated from the data as presented in Table 3 using formula 4 and generated the values as given in Table 4.

Table 4: **Standard Deviation**

Sr.	Country	1	2	3
0	Reference Sequence	1.0000	1.0000	1.0000
1	Afghanistan	0.9999	0.9999	0.999
2	Albania	0.9999	0.9998	0.9993
…	…	…	…	…
…	…	…	…	…
131	Peru	0.9981	0.9378	0.5927
132	Philippines	0.9688	0.9535	0.8656
133	Poland	0.9994	0.9975	0.9865
…	…	…	…	…
…	…	…	…	…
182	Zambia	0.9990	0.9979	0.9917
183	Zimbabwe	0.9999	0.9996	0.9980

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In this way Table 3 is used to generate the Table 4 which is deviation from reference sequence using the formula 4. For example, calculation of Afghanistan is given below

$$\Delta_0(\gamma) = |x_0(\gamma) - x_1(\gamma)|$$

$$\Delta_1(1) = |1 - 0.001| = 0.999$$

From values as given Table 4 the Table 5 is generated by applying the formula 5 i.e. grey relational coefficients.

Table 5: Grey Relational Co-Efficient

Sr.	Country	1	2	3
0	Reference Sequence	1.0000	1.0000	1.0000
1	Afghanistan	0.3334	0.3334	0.3334
2	Albania	0.3334	0.3334	0.3335
…	…	…	…	…
…	…	…	…	…
131	Peru	0.3337	0.3478	0.4576
132	Philippines	0.3404	0.3440	0.3661
133	Poland	0.3335	0.3339	0.3364
…	…	…	…	…
…	…	…	…	…
182	Zambia	0.3336	0.3338	0.3352
183	Zimbabwe	0.3334	0.3334	0.3338

The values in Table 4 equal to absolute value of the difference between reference sequence and comparable sequence. When calculating grey relational co-efficient, the coefficient in Table 5 chosen as 0.5 (differentiator). As an example, of calculating the Grey Relational co-efficient for instance, indicator 1 of Afghanistan would be solved by using formula 5.

$$\gamma[x_0^*(k), x_i^*(k)] = \frac{\Delta_{min} + \xi\Delta_{max}}{x_{0i}(k) + \xi\Delta_{max}}, 0, < \gamma[x_0^*(k), x_i^*(k)] = \frac{0 + 0.5 * 1.00}{0.999 + 0.5 * 1.00} = 0.334$$

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The coefficients as calculated in Table 5 Grey Relational Grades are calculated using formula 6 (Table 6)

Table 6: Gray Relational Grade

Sr.	Country	Grade
1.	Afghanistan	0.3333330062218
2.	Albania	0.3333722872093
…….	…….	…….
…….	…….	…….
131.	Peru	0.3796596963678
132.	Philippines	0.3501471139825
133.	Poland	0.3345457487085
…….	…….	…….
…….	…….	…….
182.	Zambia	0.3341475827944
183.	Zimbabwe	0.3334841092624

For calculating the values of Table 6 (Grey Relational Grades), the authors have three indicators multiply the sum of all the indicators with 0.3 because (i.e. 1/3=0.333). As an example, to calculating Grey Relational Grade indicator 1 of Afghanistan would be solved by using formula 6.

$$\gamma(x_0^*, x_i^*) = \sum_{k=1}^{n} \beta_k \, \gamma[x_0^*(k), x_i^*(k)]$$

$$\sum_{k=1}^{n} \beta_k = 1$$

$$\gamma(x_0^*, x_i^*) = \sum_{k=1}^{n} \beta_k \, \gamma[x_0^*(k), x_i^*(k)] = 0.333 * SUM(0.3334 + 0.3334 + 0.3334) = 0.333$$

All the alternative are ranked according to Grey Relational Grades Table 7.

Table 7: Grey Relational Rank

Sr.	Country	Rank
1.	Afghanistan	144
2.	Albania	129
…….	…….	…….
…….	…….	…….
131.	Peru	4
132.	Philippines	12
133.	Poland	52
…….	…….	…….
…….	…….	…….
182.	Zambia	65
183.	Zimbabwe	112

Table 7 is prepared using the ranking formula implemented in the formula of Rank in MS Excel (Table 9).

Results and Discussion

From the scheme of analysis as entailed above the authors reached to the results as contained in Table 9 (Gray relational rank and gray relational grade) as mentioned in Table 9.for the sake of convenience and better understanding of the readers the authors have engaged ensigns' method as explained in Table 8

Table 8: Scheme of grouping the countries under the different ensigns on the basis of grey relational grades of fisheries

Sr.	Ensign	Description
1	Excellent	Countries having a grey relational grade ranging from 0.999900 to 0.33334706 are considered as having an excellent position in fisheries.
2	Good	Countries having a grey relational grade ranging from 0.333347026 to 0.333630 are considered as having a good position

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		in fisheries.
3	Fair	Countries having a grey relational grade ranging from 0.3336298 to 0.333334998 are considered as having a fair position in fisheries.
4	Poor	Countries having a grey relational grade ranging from 0.33334992 to 0.3333002 are considered as having a poor position in fisheries.

The importance of this research is that we can now tell the position of Pakistan against the world on the basis of facts and figures the main problem was that many researchers gave their opinion on the aspect of fisheries but they highlight the problems not giving the technical solution.

Table 9: Results of Grey Relational Analysis

Country	Grade	Rank	Country	Grade	Rank
Excellent			**FAIR**		
China	0.9999000000000	1	Iraq	0.3336298688733	93
Indonesia	0.4383515199060	2	Niger	0.3336091543067	94
India	0.4025722461256	3	South Sudan	0.3336039859330	95
Peru	0.3796596963678	4	Sudan	0.3336024473139	96
Russian Federation	0.3758236967800	5	Nepal	0.3335945896276	97
Viet Nam	0.3711190183887	6	Kazakhstan	0.3335931457944	98
United States	0.3684278329795	7	Tuvalu	0.3335765527214	99

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Japan	0.3572279281119	8	Honduras	0.3335635195479	100
Chile	0.3559570997173	9	Costa Rica	0.3335480321570	101
Norway	0.3555522980854	10	Guyana	0.3335359912275	102
Bangladesh	0.3528747424929	11	Rwanda	0.3335336694243	103
Philippines	0.3501471139825	12	Mauritius	0.3335178374164	104
Myanmar	0.3486806991972	13	Suriname	0.3335177684266	105
Mexico	0.3456011094676	14	Fiji	0.3335111492744	106
Thailand	0.3446979748410	15	Libya	0.3335105168435	107
Morocco	0.3443720757240	16	Gabon	0.3335004590862	108
Malaysia	0.3434109744579	17	Burkina Faso	0.3334956731696	109
Iceland	0.3433012898348	18	Liberia	0.3334919777534	110
Ecuador	0.3399579327117	19	Central African Republic	0.3334876796596	111
Brazil	0.3397299525141	20	Zimbabwe	0.3334841092624	112
Spain	0.339227843969	21	Guatemala	0.333481838249	113

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	6			6	
Egypt, Arab Rep.	0.3390682570303	22	Ukraine	0.3334732700047	114
Nigeria	0.3390230930831	23	Paraguay	0.3334518897495	115
Argentina	0.3390021881412	24	Togo	0.3334408835798	116
Oman	0.3383067734443	25	Burundi	0.3334296154088	117
Canada	0.3383001533024	26	Bahrain	0.3334280982537	118
Faroe Islands	0.3375205264321	27	Dominican Republic	0.3334230048595	119
Cambodia	0.3374340192339	28	Cuba	0.3334217074157	120
France	0.3372051288614	29	Belgium	0.3334211524322	121
Ghana	0.3369776676422	30	Qatar	0.3334191358237	122
Pakistan	0.3369051738013	31	Brunei Darussalam	0.3334127058917	123
Senegal	0.3368339320958	32	Haiti	0.3334108421976	124
South Africa	0.3364439713806	33	Turkmenistan	0.3333976666231	125
Turkiye	0.3364383575370	34	Trinidad and Tobago	0.3333842518650	126
Uganda	0.336416370173	35	Jamaica	0.333382469958	127

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	6			7	
Angola	0.3363997795965	36	French Polynesia	0.3333778211933	128
Denmark	0.3363896744098	37	Albania	0.3333722872093	129
Mozambique	0.3363183299121	38	Hungary	0.3333639647753	130
Namibia	0.3360353760152	39	Samoa	0.3333617745374	131
New Zealand	0.3357648958589	40	Romania	0.3333606082806	132
Sri Lanka	0.3355877616995	41	Bahamas, The	0.3333601740850	133
Guinea	0.3354971167632	42	Curacao	0.3333568224574	134
Netherlands	0.3353259892652	43	Czechia	0.3333566768788	135
Cameroon	0.3352752859392	44	Bulgaria	0.3333532390864	136
Papua New Guinea	0.3348557693998	45	Malta	0.3333507854820	137
Ireland	0.3347062695544	46	Cabo Verde	0.3333499865539	138
GOOD			**POOR**		
Sierra Leone	0.3347026766061	47	Armenia	0.3333499266045	139
Belize	0.3346361955883	48	Timor-Leste	0.3333451704492	140

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Kiribati	0.3346244721346	49	Equatorial Guinea	0.3333425284574	141
Australia	0.3346017213309	50	Israel	0.3333382548661	142
Georgia	0.3345932669509	51	Kyrgyz Republic	0.3333376627446	143
Poland	0.3345457487085	52	Afghanistan	0.3333330062218	144
Panama	0.3345366399436	53	Syrian Arab Republic	0.3333316105246	145
Malawi	0.3345295280305	54	New Caledonia	0.3333296322526	146
Germany	0.3345179615660	55	West Bank and Gaza	0.3333282229495	147
Italy	0.3344750472544	56	Serbia	0.3333256791364	148
Yemen, Rep.	0.3344595847208	57	Cyprus	0.3333220239732	149
Portugal	0.3343777834952	58	Antigua and Barbuda	0.3333207046563	150
Colombia	0.3343713391508	59	Tajikistan	0.3333195583071	151
Sweden	0.3343087407318	60	Lebanon	0.3333184349254	152
Kenya	0.3342999936818	61	Slovak Republic	0.3333168014861	153
Seychelles	0.3341952945262	62	Channel Islands	0.3333167622119	154

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Tunisia	0.3341737145924	63	Belarus	0.3333151408616	155
Madagascar	0.3341714684142	64	Switzerland	0.3333139526498	156
Zambia	0.3341475827944	65	Kuwait	0.3333128329374	157
Finland	0.3341259345742	66	Azerbaijan	0.3333122166681	158
Mali	0.3340319975547	67	Grenada	0.3333118400779	159
Lithuania	0.3340023156990	68	Austria	0.3333106536304	160
Chad	0.3339941974521	69	Eritrea	0.3333100884311	161
Nauru	0.3339923502269	70	Puerto Rico	0.3333100414332	162
Greece	0.3339826094651	71	Singapore	0.3333097811142	163
Ethiopia	0.3339594294797	72	St. Lucia	0.3333095071074	164
Cote d'Ivoire	0.3339592761087	73	Bosnia and Herzegovina	0.3333089828916	165
Saudi Arabia	0.3339341941528	74	Jordan	0.3333088656597	166
Marshall Islands	0.3338939046710	75	Tonga	0.3333085550543	167
Uzbekistan	0.3338930675462	76	American Samoa	0.3333083097063	168

Vanuatu	0.3338709958780	77	Montenegro	0.3333073087696	169
Algeria	0.3338327970062	78	British Virgin Islands	0.3333071379002	170
Hong Kong SAR, China	0.3338060918977	79	North Macedonia	0.3333059970640	171
Benin	0.3338011366786	80	Barbados	0.3333053194371	172
Estonia	0.3337802330590	81	Palau	0.3333050792294	173
Tanzania	0.3337694366458	82	Slovenia	0.3333045587476	174
Croatia	0.3337615731304	83	St. Kitts and Nevis	0.3333041445540	175
Uruguay	0.3337454306773	84	Lesotho	0.3333036612075	176
United Arab Emirates	0.3337304281299	85	Guam	0.3333022772805	177
Congo, Rep.	0.3337168563357	86	Dominica	0.3333016883300	178
Guinea-Bissau	0.3337131638121	87	Aruba	0.3333009246533	179
El Salvador	0.3337124929830	88	Cayman Islands	0.3333007785246	180
Nicaragua	0.3337050151027	89	Eswatini	0.3333004129687	181
Latvia	0.3336996104030	90	Botswana	0.3333003677786	182

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Gambia, The	0.3336490299872	91	Bhutan	0.3333002167024	183
Solomon Islands	0.3336309491346	92			

From the table 9 we find that Pakistan ranks on 31st position in world on the basis of production of fisheries. Which the authors believe that it is excellent (As per the scheme evolved in the study). However, the literature review still highlights many allied issues of the fisheries production that could be addressed by Pakistan government to strengthen their position even better. The fisheries sector plays a pivotal part in global food security, livelihoods, and profitable development. According to the Food and Agriculture Organization (FAO, 2022), fish accounts for about 17 of (Memon & Ahmed, 2022) the global population's beast protein input, emphasizing its significance. The discussion will look at the current state of fisheries product, especially in a region like Pakistan, the challenges facing the sector and implicit results to enrich productivity (Mehmood & Shah, 2020). The product of fisheries around the world is constantly adding, substantially in the fields of monoculture and fisheries enhancement.

(Farooq & Memon, 2022) stated, world product of fish reached roughly 179 million tons, reaching an aggregate of 46 of fishery husbandry. It's produced by countries similar as China, Indonesia, and India, indicating that the integration of technology and stable practices has been successful (World Bank, 2021). On the negative, the product of fish and husbandry in Pakistan does not follow the global trend. The country produced roughly 1.1 million tons of fish in 2020, ranking 18th in the world (Feroz & Qureshi, 2021). Still, the sector faces significant challenges, including overfishing, niche declination, and poor operation (Khan et al., 2019). Overfishing is a significant issue as numerous fish stocks are exploited beyond their natural limits according to (Basit & Asghar, Niazi & Qazi, 2021) roughly one-third of the world's fish stocks are overfished, which is apparent in Pakistan's

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waters (Ali et al., 2020). The lack of effective fisheries operation strategies has led to a decline in crucial species, affecting both communities and original husbandry (Muhammad & Farooq, 2022). Environmental changes, including climate change, pollution, and niche, loss, are farther aggravating fisheries- related problems. Exploration shows that rising ocean temperatures and ocean acidification are negatively impacting fish populations and ecosystems (Bashir et al., 2021). In Pakistan, artificial backwaters and inappropriate waste disposal have caused severe pollution of water bodies, hanging submarine life (Ahmed & Qureshi, 2020). Profitable constraints and ineffective programs are hindering the growth of the fisheries sector limited investment in exploration and development restricts technological advancements, while shy nonsupervisory fabrics promote unsustainable fishing practices going

(Siddique, al., 2022). Also, political insecurity and lack of structure hinder the growth of the sector (Khokhar & Hussain, 2021). Lack of ultramodern structure for processing, storehouse and transportation of fisheries products reduces the quality and competitiveness of fisheries (Zafar & Ali, 2020). In Pakistan, post-harvest losses are estimated at around 30 due to shy cold chain capacity (Khan et al., 2019). Espousing sustainable fishing practices is essential to maintaining fish stocks and healthy ecosystems. Success stories from around the world show that enforcing community grounded fisheries operation can upgrade original governance and reduce overfishing (WorldWildlifeFund, 2023). Monoculture development can significantly increase fish product (Bhatt & Ahmed, 2021). Exploration shows that monoculture can reduce pressure on wild fish stocks while furnishing a sustainable source of protein (Rahman et al., 2021). In Pakistan, investment in ultramodern monoculture styles can increase productivity and profitability (Memon et al., 2023). The preface of technology into fisheries can lead to more effective product and operation. The use of satellite technology to cover fish stocks and artificial intelligence to prognosticate catches are promising developments (Bhatt & Khawaja, 2021). Strengthened operation fabrics and programs are essential for sustainable fisheries operation (Manzoor & Khan, 2021). Establishing clear regulations and effective monitoring and enforcement mechanisms will help combat illegal fishing and promote sustainable practices (Ahmed & Qureshi, 2020). Educating fishermen on sustainable fishing practices and furnishing training in ultramodern fishing ways can increase productivity across the fishing sector (Zafar & Ali, 2020). Community engagement and mindfulness programs help promote a culture of sustainability and responsible fishing (Muhammad & Farooq, 2022).

Conclusion

Grey system Theory is applied to systems with incomplete or uncertain data, enabling the extraction of valuable insights despite the lack of full knowledge about the system (Qureshi & Ahmed, 2021). Grey Relational Analysis is an integral part of Grey System Theory. The method starts by establishing a reference sequence, which act as a standard or ideal for comparison. Next, the data is normalized, and Grey Relational Co-efficient and Grey Relational Grade are calculated for the comparable sequences can be assessed. The sequence with a higher correlation is considered more ideal, and thus, a ranking of the sequences is performed. In this study 183 countries were compared under 3 indicators of aquaculture were obtained from website of world development indicator. In comparison the Grey Relational Analysis method was used, as it more accurately measures the relative performance and represents the characteristics of the alternatives. In this study the weights of the criteria were considered equal. Pakistan ranks at 31st position in the world which is undoubtedly excellent.

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