

Nexus Between Chicken Meat Production, Consumption, GDP, and Trade Openness Across the SAARC Countries; Evidence from 1993–2022

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Abstract – *The Poultry production industry is vital for maintaining food security and promoting sustainable agriculture in South Asian countries due to fast population growth, shifting dietary habits, and the growing demand for affordable protein sources. Therefore, this study aims to investigate the relationships among chicken meat production, chicken meat consumption, gross domestic product, and trade openness over 30 years (1993–2022) across five SAARC countries. consumer demand theory and international trade theory served as the foundation for this study, and Wavelet coherence methodology and Granger causality analysis were used to identify the direction of causality between variables. The findings revealed that bidirectional causalities in chicken meat production are associated with consumption and GDP, while trade openness shows a unidirectional causal flow with chicken meat production. Furthermore, this study provides novel insights and policy implications for the policy makers, international and domestic organisations, and governments towards a sustainable meat industry that aligns with the Sustainable Development Goals introduced by the United Nations.*

Keywords: Chicken Meat Production, Chicken Meat Consumption, Gross Domestic Product, Trade Openness, and Granger Causality Analysis

I. INTRODUCTION

Poultry meat is known for its great nutritional values and affordability, and globally, the most consumed meat is poultry meat. Moreover, the global meat production reached up to 337 million, with chicken contributing 35% in 2020 ([Food and Agricultural Organisation \(FAO\), 2022](#)) and in 2023 rose to 146 million tons ([Ludwiczak et al., 2025](#)). Furthermore, it is predicted that poultry meat consumption will increase more in the future ([Khan et al., 2025](#)). By 2030, poultry meat will provide 41% of the world's meat ([Fanatico et al., 2025](#)). It is an affordable protein for all social, religious, and economic groups ([Alam et al., 2025b](#)). The worldwide poultry farming has increased due to consumer demand for chicken meat ([Kinsner et al., 2025](#); [Shahriar et al., 2025](#)). Chicken meat production (CMP) is considered a sustainable product due to its short production process, efficient feed adjustments, and low methane emissions ([Nieto-Villegas et al., 2025](#)). Consumer demand for chicken meat is high due to its nutritional value and flavour of meat ([Ning et al., 2025](#); [Qi et al., 2025](#)). Also, provides food security ([Shahriar et al., 2025](#)), high-quality protein ([Składanowska-Baryza et al., 2025](#)), excellent feed efficiency ([Fanatico et al., 2025](#)), low fat, low cholesterol, and low calories ([Qi et al., 2025](#)) in chicken meat.

The poultry industry is the largest livestock industry in Bangladesh, providing nutrition for the people and employment opportunities ([Akter et al., 2025](#)) for the rural people to reduce unemployment. In addition, from 2023 to 2024, it produced 396 million tonnes of poultry meat and also experienced an annual growth ([Akter et al., 2025](#)). In Nepal, chicken meat production is increasing from 43,133 tonnes to 200,658 tonnes ([Subedi et al., 2025](#)). India was the fifth-largest poultry meat-producing country in 2022,

contributing 4.9 million tons of chicken and exporting chicken products to countries such as the USA, Oman, the Netherlands, and Japan (Sivasankar et al., 2025). Moreover, Pakistan produced 1.55 billion broiler chickens annually, and the annual poultry meat production is 1,977,000 tonnes as of 2025 (Amin et al., 2025), contributing to meeting the global demand.

Therefore, the purpose of this study is to investigate the causal relationship between chicken meat production and chicken meat consumption (CMC), gross domestic product (GDP), and trade openness (TO) for five countries from the South Asian Association for Regional Cooperation (SAARC) for the period from 1993 to 2022. In past studies, these variables have been focused on individually. However, this study investigates those variables together and uses advanced dual methodologies, wavelet coherence analysis, and Granger causality analysis, to provide novel insights into the relationships of these variables.

The results of the study provide valuable insights for the policy makers, international and domestic organisations, and the governments in aligning with several Sustainable Development goals (SDGs) set by the United Nations, SDG 1: No Poverty, SDG 2: Zero Hunger, SDG 3: Good Health and Well-Being, SDG 4: Quality Education, SDG 8: Decent Work and Economic Growth, SDG 9: Industry, Innovation and Infrastructure, SDG 12: Responsible Consumption and Production and SDG 17: Partnership for the Goals.

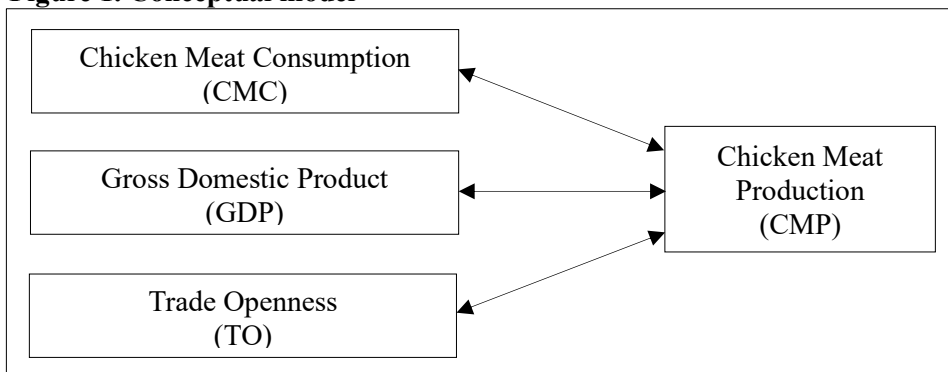
II. CONCEPTUAL MODEL AND LITERATURE REVIEW

This section provides the conceptual model of this study, with theoretical perspectives and a critical literature review of past studies.

A. Conceptual Model

The conceptual model of the variables is presented in Figure 1 to show the connection between the variables.

Figure 1. Conceptual model



Source: Authors' compilation.

The interconnectivity between CMP and its key variables, CMC, GDP, and TO, can be identified through several theoretical perspectives.

Consumer demand theory explains how consumers will decide what they want to purchase according to the satisfaction level, while staying within a fixed price range, which is limited to their income (Basmann, 1956). In the context of chicken meat

production, consumption increases due to high-quality proteins, flavours, affordability, food security, and a low risk of health issues.

International trade theory is the process of exchanging physical or electronic goods and services across country boundaries ([McConnell et al., 2001](#)). For chicken meat production, trade openness provides significance by expanding the meat industry in the international market and increasing income through imports and exports. These theories provide a foundation for CMP and its key variables.

B. Literature Review

The poultry industry is a multimillion-dollar industry, and it is considered the largest part of the agricultural sector ([Choudhury et al., 2025](#)). As most people consume poultry meat around the globe ([Ning et al., 2025](#); [Qi et al., 2025](#)) It will be the most produced meat in the world ([FAO, 2024](#)). Chicken meat is popular for its high nutritional value ([Mishra et al., 2023](#); [Sparrow et al., 2024](#)) and affordability ([Debbarma et al., 2024](#); [Gkarane et al., 2020](#); [Mir et al., 2017](#)). In South Asia, factors that influence poultry production in some SAARC member countries are very intriguing. For instance, in Sri Lanka, backyard chicken farming takes different directions due to political and cultural factors ([De Zoysa et al., 2025](#)). In addition, with the high demand for poultry meat, the government of Sri Lanka decided that poultry is an essential food ([Wickramarachchi et al., 2017](#)) and in the international trade market, it is a common food ([Samaraweera et al., 2021](#)). However, sometimes Sri Lankan broiler chicken meat is infected with *Salmonella* spp ([Jayaweera et al., 2020](#)), because farmers have not vaccinated their birds due to limited knowledge of poultry management ([Gunasekara et al., 2025](#)). This can affect poultry production, consumption, and international trade.

Furthermore, in Bangladesh, systematic and scientific measures have been taken to enhance backyard poultry farming and generate income for farmers ([Sultana et al., 2025](#)). Additionally, to reduce the antibiotic usage and improve chicken health, Bangladesh leans towards good farming practices ([Chandrakar et al., 2023](#); [Hennessey et al., 2025](#); [Lambrecht et al., 2023](#)). In India, chicken meat consumption has increased rapidly over the past twenty years ([Ayoub et al., 2025](#); [Haunshi et al., 2022](#); [Kathiravan & Chitrambigai., 2024](#)), and it can produce high production and growth ([Rajkumar et al., 2017](#)). It has obtained a high place in the international market ([Jasdeep & Rudhita, 2024](#)). Moreover, for improving health and human growth, Indian Kadaknath chicken meat serves as a significant source ([Sharma et al., 2022](#)), and it is high in antioxidant capacity ([Sehrawat et al., 2021](#)). In Nepal, poultry production has highly contributed to the economy ([Napit et al., 2023](#)), with the total GDP, about 3.5% ([Roshan et al., 2019](#)). However, Newcastle Disease has affected the poultry farming worldwide, even in Nepal ([Poudel & Dahal., 2020](#)), Pakistan ([Ali et al., 2025](#)). This has affected the production and economy in the poultry industry.

Furthermore, in Pakistan, the poultry sector plays a key role in economic growth ([Ali Khan et al., 2025](#)). Therefore, better management practices are used in poultry farms to improve the health of the birds ([Amin et al., 2025](#)). Moreover, important studies have been conducted in SAARC countries regarding backyard poultry production, ([Siddiky, 2020](#)). It is a great source of income for low and middle-income countries ([Chauhan et al., 2024](#); [Ibrahim et al., 2025](#); [Muñoz-Gómez et al., 2025](#); [Muñoz-Gómez & Torgerson, 2024](#)) like SAARC countries. In the poultry production sector, numerous factors can influence production.

There is a massive contribution to the literature regarding the poultry sector. However, there seems to be a literature gap in the chicken meat production sector, and it

does not utilise multiple variables across several countries and some studies that already exist are associated with GDP and trade openness, in the context of chicken meat production. Therefore, this study delivers a vast variety of literature value by combining SAARC countries together and multiple variables to analyse the linkage between chicken meat production by using comprehensive methodologies. This literature will help to improve the sustainability of the poultry industry.

III. DATA AND METHODOLOGY

This section highlighted the data and statistical methodologies that were utilised to obtain the findings in this study.

A. Data

This study consisted of five countries relevant to the SAARC member states and utilised secondary data, and the sources were presented in Table 1. The utilised panel dataset is displayed in Appendix 1.

Table 1. Data sources and variables

Variable	Measurement	Source
Chicken Meat Production (CMP)	Kg per capita	(Food and Agriculture Organisation Statistics, 2025b)
Chicken Meat Consumption (CMC)	Kg per capita	(Food and Agriculture Organisation Statistics, 2025a)
Gross Domestic Product (GDP)	Per capita (current US \$)	(World Bank, 2025a)
Trade Openness (TO)	Percentage of GDP	(World Bank, 2025b)

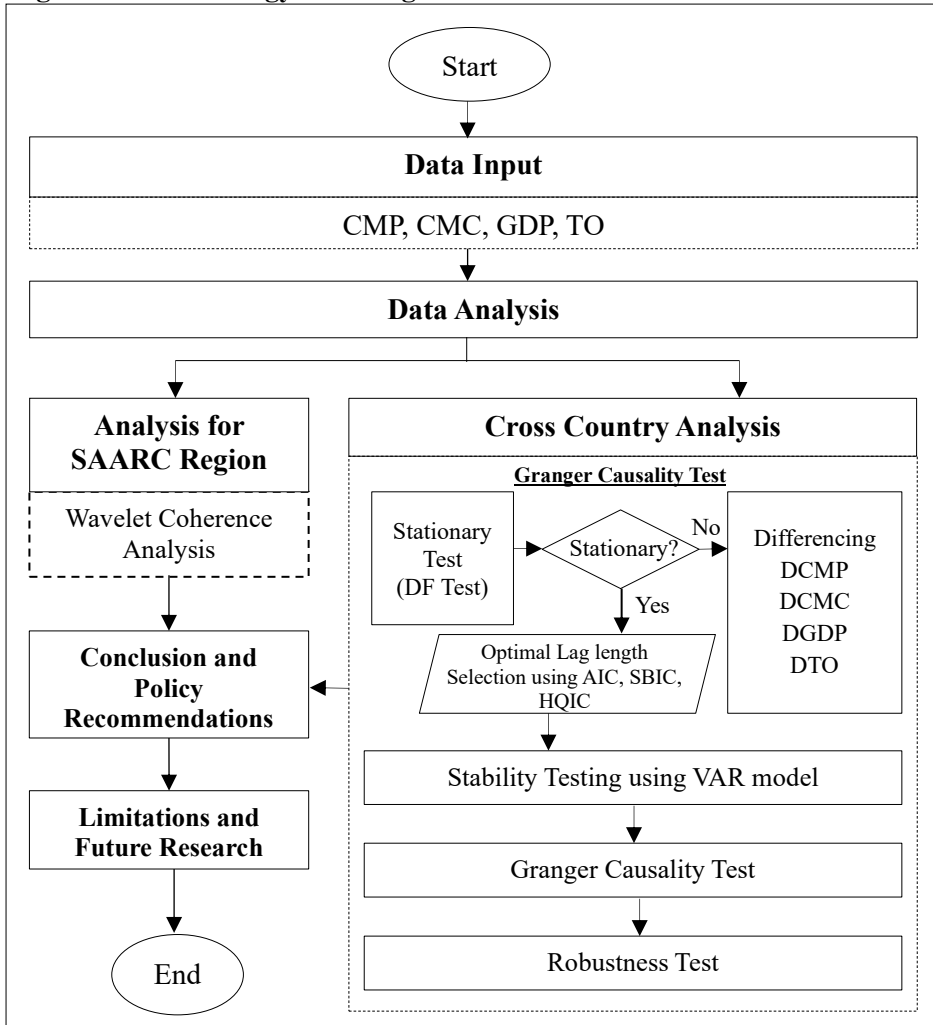
Source: Authors' compilation.

All variables were measured in per capita, and the CMP and CMC data were retrieved through the Food and Agriculture Organisation database, GDP and TO were retrieved through the World Bank.

B. Methodology

To investigate the nexus between variables in South Asian countries, dual methodologies were utilised in this study. The flow of the analysis presented in Figure 2.

Figure 2. Methodology flow diagram



Source: Authors' illustration.

In this study, wavelet coherence and Granger causality analysis were utilised to obtain the novel findings for the sustainable poultry industry.

1) Wavelet Coherence Analysis: Wavelet coherence methodology was employed to identify the direction of causal progression and the nature of coherence at frequencies between variables throughout the time periods (Wijesuriya et al., 2025). This method is widely used in various studies (Caldera et al., 2024; Lan et al., 2025) relevant to various disciplines.

Statistical expression for wavelet methodology shown in Equation 1, where the Morlet Wavelet function is depicted in $\psi^{a,b}$. Scale and the translation present in a and b , respectively.

$$\psi^{a,b}(x) = |a|^{-\frac{1}{2}} \psi\left(\frac{x-b}{a}\right) \quad (1)$$

Utilisation of wavelet coherence benefited in identifying the causal flows and nature between the variables. Also benefited from identifying the obtained results in a different time series (long, short, and medium terms). The R software generated the wavelet graphs.

2) Granger Causality Analysis: Granger causal analysis was employed to identify the direction of causal flows between variables at a country level, and this methodology has been extensively used in a wider range of studies ([Jayathilaka et al., 2025](#); [Jayawardhana et al., 2023](#)) relevant to various sectors.

Firstly, we utilised the Dicky-Fuller (DF) unit root test ([Dickey & Fuller, 1979](#)) to examine the stationarity and existence of unit root found variables, which should convert to differences until the variable is stationary. The Vector Autoregression (VAR) model conducts Akaike's Information Criterion (AIC) ([Akaike, 1998](#)) Schwarz's Bayesian Criterion (SBIC) ([Schwarz, 1978](#)) and the Hannan and Quinn Information Criterion (HQIC) ([Hannan & Quinn, 1979](#)) to find the optimal lag length and check the stability of the model accordingly.

Finally, proceed with the Granger causality analysis, and Equation 2 showcases this statistical expression.

$$Y_{i,t} = \sum_{k=1}^{\rho} \varpi_i Y_{i,t-k} + \sum_{k=0}^{\rho} \pi_k X_{i,t-k} + u_{i,t} \quad (2)$$

Independent and dependent variables are shown in X and Y, respectively. Country and period shown in i and t , while ρ symbolised the number of lags. Frequency of lags shown in k . The coefficient of regression depicted in ϖ and π is the constant value of regression, where k may take any value within the range from 1 to N. The error term is delineated in u .

This methodology is a sophisticated method for identifying the causal progressions between variables in a country-wise manner to get a broader, robust understanding and predict future values. This provides advantages to policymakers to establish policies at the country level in response to different environmental changes. Therefore, this time series analysis was employed in this study to evaluate individual SAARC countries.

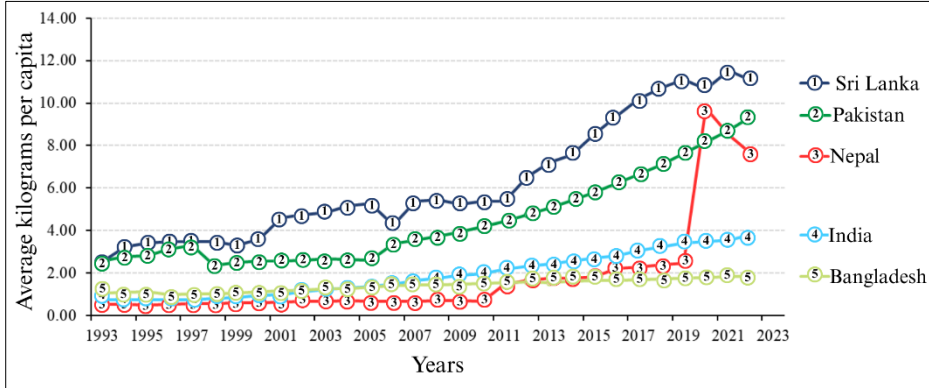
IV. RESULTS AND DISCUSSION

This section presents the findings obtained through descriptive statistics, wavelet coherence, and Granger causality analysis with a critical discussion.

A. Descriptive Analysis

Descriptive statistics were calculated to understand the distribution and basic functioning of the data set. Appendix 2 presents the summary of the descriptive statistics for the variables, and their visual representation is shown in Figure 3.

Figure 3. Average chicken meat production from 1993 to 2022

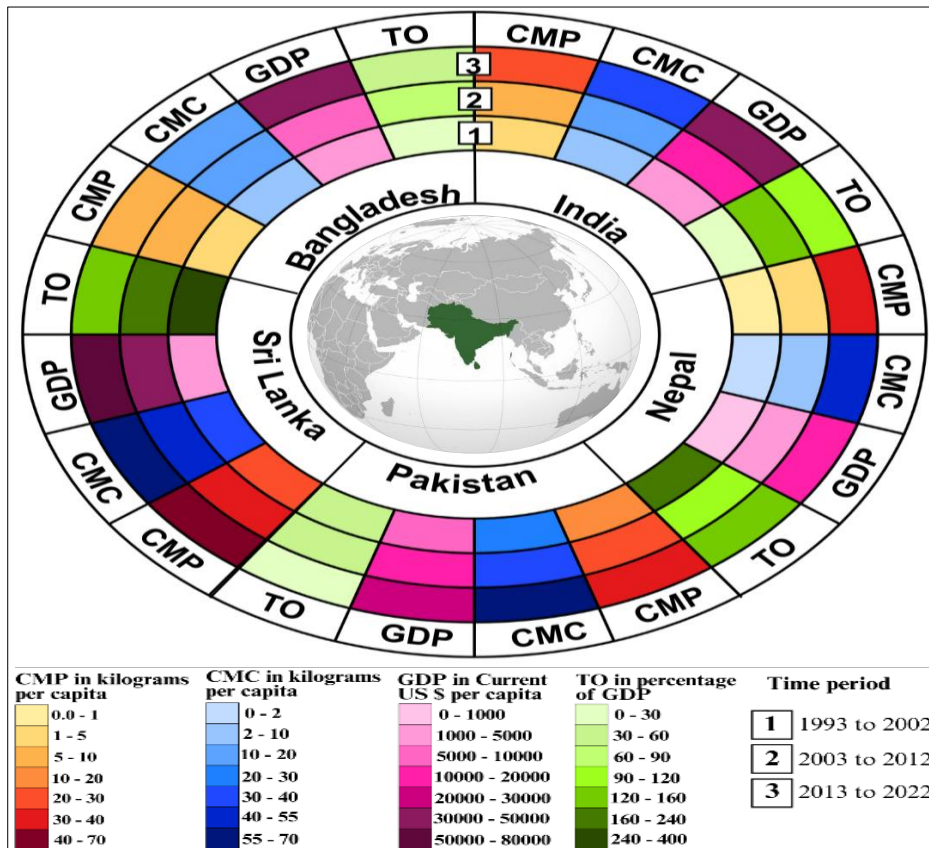


Source: Authors’ illustration based on the Food and Agriculture Organisation Statistics data (2025).

To gain a clear understanding of fluctuations in chicken meat production in the countries, a line chart was utilised. The chicken meat production per capita is highest and stable in Sri Lanka and Pakistan, and shows a sudden, sharp increase in Nepal after 2017. India has a slight increase in its chicken meat production. However, Bangladesh's has remained relatively lower compared to other countries for the overall period.

As shown in Figure 4, the average value behaviours of the variables over three periods provide a comprehensive understanding of how the variables are increased and decreased over the periods.

Figure 4. Average of all variables for two periods from 1993 to 2002 and 2013 to 2022



Note: The first, second, and third colour ring shows the variables' mean for the period from 2013 to 2022, 2003 to 2012, and 1993 to 2002, respectively.

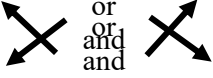
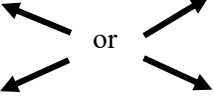
Source: Authors' illustration based on the Food and Agriculture Organisation Statistics data (2025).

In Sri Lanka and Pakistan shows a significant increase in chicken meat production and consumption, while in Bangladesh, there shows a significant decrease for the period from 1993 to 2022. In addition, all countries, including Bangladesh, India, Nepal, Pakistan, and Sri Lanka, show an increase in chicken meat production, consumption, and gross domestic product in all three periods. The reason is that when income increases, people turn to consuming chicken meat, which leads to an increase in chicken production (Alahakoon et al., 2016) as well as the gross domestic product. Furthermore, Sri Lanka and Nepal show a decline in trade openness in two time periods from 2003 to 2012 and 2013 to 2022.

B. Results of Wavelet Coherence Analysis

The wavelet graphs showcase the causal relationship between the variables according to the coherence results obtained by analysing the grey-shaped cone. The black line in the graphs indicates a 5% significance level according to the Monte Carlo Simulation. The presence of correlation is indicated by the red/orange area, and the absence of correlation is indicated by the blue area. The additional interpretation instructions are provided in Table 2 to get a deeper clarification of the graphs.

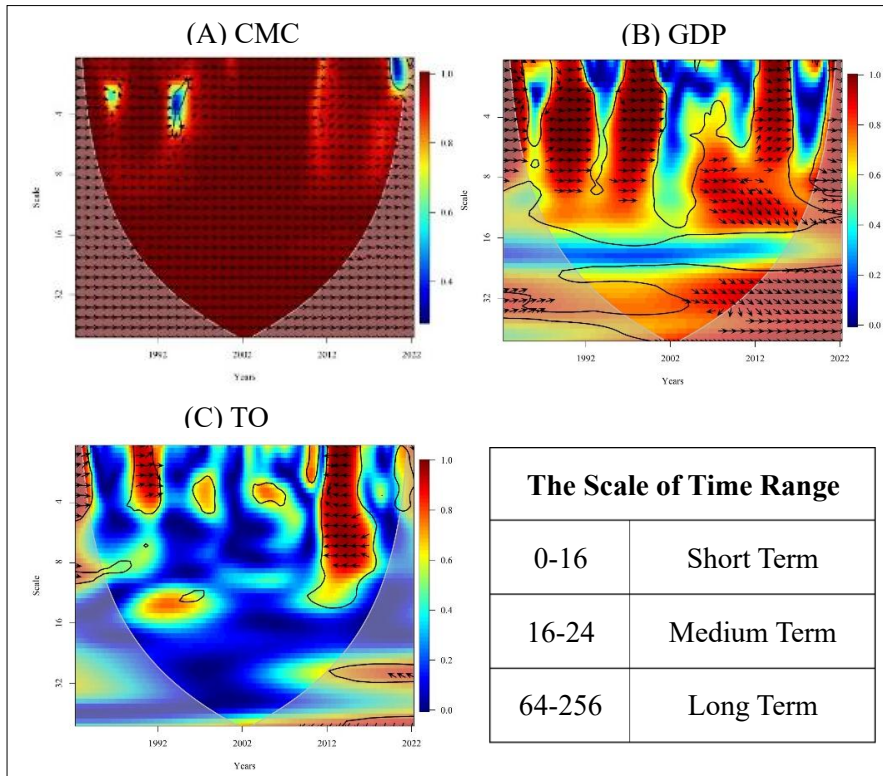
Table 2: Interpretation of wavelet coherence

Symbol	Description
→	Positive Correlation
←	Negative Correlation
	The second variable (CMC, GDP, TO) causes the first variable (CMP).
	Bidirectional causal flow between the first variable (CMP) and the second variable (CMC, GDP, TO).

Source: Authors' compilation.

The wavelet graphs presented in Figure 5 are generated for the selected countries by taking the dependent variable as the CMP and then considering the independent variables as CMC, GDP, and TO.

Figure 5. Wavelet coherence graphs for the SAARC member states



Source: Authors' compilation using R-Software (2025).

The causal flows between the CMP and CMC are shown in Figure 5(A), and the positive nature of coherence is present between CMP and CMC throughout all the terms, along with two-way causal relationships, which can be observed from 1993 to 2022 in all the terms with a high frequency throughout the graph.

The correlations between CMP and GDP can be observed from Figure 5(B). Positive coherence with bidirectional causal flows is present between CMP and GDP in 1993-2002 and 2013-2022 in the short term, with high frequency, while from 2003 to 2012, a unidirectional causal flow is present, where CMP has an impact on GDP at medium frequency. In 1993-2002 and 2012-2022, no significant causal flows were present in the medium term, but from 2003 to 2012, unidirectional causal flows were present where CMP impacted GDP in the medium term. No long-term casualties were observed.

The relationship between CMP and TO is presented in Figure 5(C). No significant causal flows were observed from 1993 to 2012 in the short term; however, from 2013 to 2022, negative coherence with bidirectional causal flows was observed between CMP and TO at a high frequency. All the other terms seem to be statistically insignificant throughout time.

An overall picture of the variables can be drawn from the wavelet coherence results for the countries, but in the following section, the Granger causality results provide a much deeper analysis within the countries.

C. Results of Granger Causality Analysis

First, the DF test was used to check the stationarity of the variables, and the results were presented in Appendix 3. As per the results, all variables were stationary at the maximum of the first difference, except GDP in Bangladesh, and it was stationary at the second difference (DCMP, DCMP, DGDP, DTO).

Then the VAR model identified the stability and optimal lag for the model. In the stability check, all eigenvalues lie within the unit root circle; hence, it verified the stability of the model. As per AIC, SBIC, and SQIC lag selection, the minimum criteria were selected. After all these prerequisite tests were obtained, the Granger casualty analysis and results were presented in Appendix 4, and Figure 6 presents the novel visualisation for identifying the causality in SAARC countries.

The Granger causality results suggest that India has bidirectional causal flow in chicken meat production and chicken meat consumption. On the other hand, unidirectional causal flows were found from GDP and trade openness to chicken meat production.

Past studies revealed that due to the increase in income, population, and urbanisation, India is dominant in poultry production ([Scudiero et al., 2023](#)) and cultural acceptance of chicken meat ([Devi et al., 2014](#)), which shows the enhancements in production. This growth enhances the trade ([Jagadeesh et al., 2024](#); [United States Department of Agriculture, 2025](#)) market in India in 2021, with 7.27 thousand metric tons ([Minhas, 2022](#)) in 2024. This is consistent with consumer demand theory, where several factors in consumer demand increase the chicken meat production within the nation. On the other hand, it aligns with the international trade theory, where the chicken meat trade market opens the door for economic growth in the nations.

Granger results in Nepal and Sri Lanka, both countries show a one-way causal progression from GDP to chicken meat production, and chicken meat consumption and trade openness show no causality with chicken meat production.

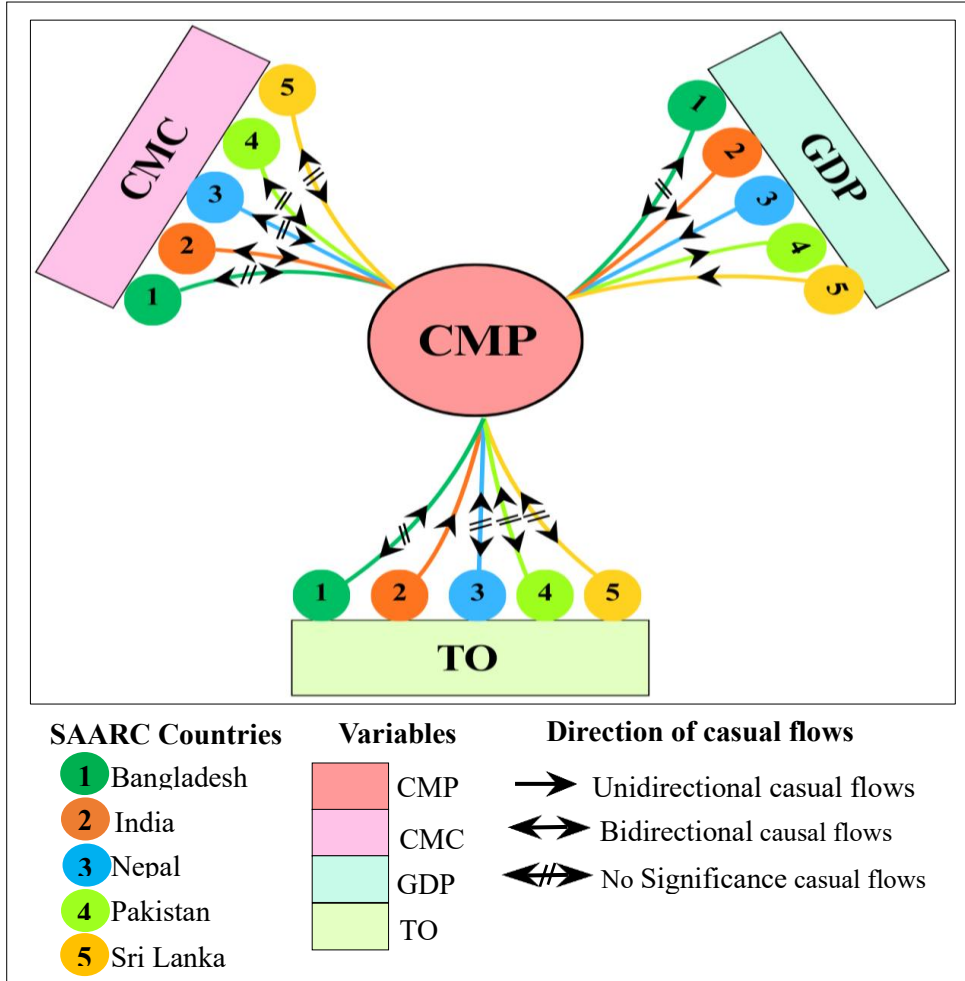
Past studies imply that due to high poverty in Nepal, the overall agricultural system's downfall results in trade market and income reductions ([Singh, 2021](#)). Studies identified enhancements in the poultry industry in Nepal that will enhance its GDP ([Adhikaria et al., 2023](#)) by being a pillar for reducing poverty ([Khanal et al., 2022](#)). These suggest that developing nations must focus on advancements in the agricultural sector to grow income in the country.

In Sri Lanka, past studies revealed that chicken meat is a main source of enhancing GDP ([Alahakoon et al., 2016](#); [De Zoysa et al., 2025](#)) while family poultry farming contributes to enhancing household income, the necessary knowledge on disease control is needed ([Gunasekara et al., 2025](#)) to secure the national income in Sri Lanka.

Pakistan shows unilateral causal flow from GDP to chicken meat production and revealed that chicken meat consumption and trade openness show no causal relationship with chicken meat production. However, past studies revealed that in Pakistan, poultry meat shows a negative relationship with agricultural GDP ([Rehman et al., 2017](#)), but for the national GDP, the poultry industry plays a major role ([Hussain et al., 2015](#)). Also, high prices ([Magbool & Bukhsh, 2007](#)) and disease reduces poultry consumption ([Ghafoor et al., 2010](#)). These suggest the enhancement of sustainable production practices in Pakistan to open the door for higher income.

However, the results from Bangladesh revealed that there was no statistical Granger causality between chicken meat production and all the variables. Most people suffer from a deficiency in nutrients; hence, past studies reveal that chicken consumption will help to enhance the nutrient levels of people in Bangladesh ([FAO, 2025](#)). Also, it helps to increase its national income by employing poultry farming ([Kamruzzaman et al., 2021](#); [Khatun et al., 2016](#); [Rahman et al., 2021](#)). However, small-scale farmers faced challenges: high feed cost, low-quality and high-price chicks, and a lack of knowledge and biosecurity in Bangladesh reduced their income ([Alam et al., 2025a](#); [Kawsar et al., 2013](#)). Due to Highly Pathogenic Avian Influenza in the country, Bangladesh significantly reduced its export market, and 75% of poultry production was based on the domestic market ([Dolberg, 2008](#)). These align with the results. Overall, all variables show an economically significant impact on the SAARC countries.

Figure 6. Granger causality analysis results for countries



Note: Numbering circles represent each country accordingly. Red, pink, blue, and green shades show CMP, CMC, GDP, and TO, respectively. Casual flows between variables are shown by arrows.

Source: Authors' illustrations-based Granger analysis results.

To verify these obtained Granger causality results, robustness checks were done, and the results are presented in Appendix 5. As shown in the results of the robustness test, the results were aligned with the revealed Granger causality results; hence, this validates that the found causal progressions between countries were robust enough to interpret the results for policy implications.

The results from the wavelet coherence approach aligned with the results from the Granger causality approach. These models strongly justify the study due to the consistency of the results. In both techniques, a bidirectional connection is shown between CMP and CMC, and other variables have shown unidirectional connections, showcasing that there is an impact from independent variables on the CMP.

V. CONCLUSION AND POLICY RECOMMENDATION

In conclusion, this study investigates the relationship between CMP and CMC, GDP, and TO in SAARC countries. Wavelet coherence and Granger causality analysis were utilised. Results revealed that high frequency casual progression in chicken meat production with consumption, while GDP shows the most unilateral casualties to chicken meat production compared to trade openness. Policy recommendations have been given according to the results, for the countries to enhance international trade and national income by enhancing innovative and sustainable chicken meat production, while supporting the Sustainable Development Goals of the United Nations.

CMP and CMC analyses show a bidirectional causality in India. Therefore, India should expand the production process by leaning more into sustainable poultry farming and making investments in the supply chain of poultry, which will enhance production while creating jobs and catering to the high demand. Then, a waste management system should be implemented to reduce the environmental impact and present a great image of chicken meat to encourage consumers. Also, for the countries with no causality, they should focus on increasing domestic production by strengthening poultry farming among the rural communities. Provide education on the nutritional benefits and encourage acceptance within different cultures to enhance the demand, which will also lead to an increase in production. These efforts will contribute to SDG 2: Zero Hunger, and SDG 3. Good Health and Well-Being, SDG 4: Quality Education, SDG 8: Decent Work and Economic Growth, SDG 9: Industry, Innovation, and Infrastructure, and SDG 12: Responsible Consumption and Production.

CMP and GDP have different unidirectional flows in various countries. A one-way causality is observed from CMP to GDP in Pakistan. To increase economic growth, they should focus on expanding the poultry sector by utilising modern technology, increasing farm area, and implementing a feed management system, which will ensure food security and the availability of affordable protein. Develop cold chain logistics, storage units, and transportation systems that can maximise the handling and secure the quality of the products. Countries with one-way causal flows from GDP to CMP should focus on initiating policies to stabilise the price of chicken, making it more affordable as income rises. Making efforts to get partnerships and foreign investment can significantly contribute to economic growth and enhance the poultry industry. These policies are aligned with SDG 2: Zero Hunger, SDG 9: Industry, Innovation, and Infrastructure, SDG 12: Responsible Consumption and Production, and SDG 17: Partnerships for the Goals.

Since there have been no causal flows from CMP to TO, all the countries should improve their domestic production to gain a space in the export market. Then, improve the quality of the products, make standards to maintain quality, and have sanitary measures to make those products ready to export. Support in improving frozen chicken products to gain space in the export market. Making partnerships by creating trade agreements to encourage exports of chicken products. A country like India, with a bidirectional causal flow, should focus on reducing tariffs on the processing equipment and feed supply to make it affordable for the farmers and increase production. Import different chicken breeds and medicine to improve the domestic production. Enforce trade policies that will protect and benefit the small-scale farmers while helping them grow their production. These polices support SDG 1: No Poverty, SDG 2: Zero Hunger, SDG 8: Decent Work & Economic Growth, SDG 9: Industry, Innovation, and Infrastructure, SDG 12: Responsible Consumption and Production, and SDG 17: Partnerships for the Goals.

VI. LIMITATIONS AND FUTURE OPPORTUNITIES

As for the limitations, this study focuses on selected SAARC countries due to the lack of data availability for all selected variables in all the countries for the selected period. Therefore, this study has future potential to be expanded by including more countries, considering a specific continent, or an income group. Moreover, advanced alternative methodologies can be used to analyse variable data and provide novel insights and findings. Despite the limitations, this study provides tremendous value to the existing literature.

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APPENDICES

Appendix 1. Data File

<https://docs.google.com/spreadsheets/d/1Cy1q7NmwgKpoMA9jJoSxP7czDPHj18bZiroeLRe-9jI/edit?usp=sharing>

Note: SD represents the Standard Deviation. CMP, CMC, GDP and TO represent Chicken meat production, Chicken meat consumption, Gross domestic product and Trade openness respectively. Number of observations for all countries is equal to 30 (N = 30).

Appendix 2. The dicky-fuller unit root test results; classified by countries

Countries and variables		Descriptive Statistics						
		Mean	SD	Min	Max			
SAARC Countries (N = 150)	CMP	3.15	2.70	0.5	11.53			
	CMC	2.81	2.39	0.43	10.56			
	GDP	1292.07	1074.37	205.53	4777.95			
	TO	42.3	15.48	19.65	88.65			
Bangladesh	CMP	1.40	0.28	0.98	1.85			
	CMC	1.27	0.26	0.88	1.66			
	GDP	1043.63	808.8	326.54	3005.55			
	TO	33.41	7.46	22.87	48.11			
India	CMP	1.89	1.01	0.72	3.81			
	CMC	1.69	0.90	0.66	3.49			
	GDP	1214.56	716.26	351.22	2559.9			
	TO	38.07	11.71	19.65	55.79			
Nepal	CMP	1.824	2.413	0.5	9.76			
	CMC	1.636	2.150	0.43	8.7			
	GDP	650.699	433.607	205.53	1530.439			
	TO	47.855	6.416	36.297	64.036			
Pakistan	CMP	4.43	2.1	2.36	9.34			
	CMC	3.78	1.77	1.99	8.4			
	GDP	1107.69	457.48	483.85	1815.56			
	TO	30.21	4.68	21.46	38.5			
Sri Lanka	CMP	6.223	2.842	2.53	11.53			
	CMC	5.668	2.494	2.2	10.56			
	GDP	2443.765	1569.450	671.758	4777.946			
	TO	61.924	17.118	37.089	88.636			
Countries	CMP	DCMP	CMC	DCMC	GDP	DGDP	TO	DTO
Bangladesh	0.396	-5.228***	-0.081	-5.183***	5.508	-8.26***D2	-1.79	-4.334***
India	3.922	-3.086**	0.551	-7.556***	1.041	-5.751***	-1.33	-4.497***

Countries	CMP	DCMP	CMC	DCMC	GDP	DGDP	TO	DTO
Nepal	-0.665	-6.008***	-0.584	-5.756***	1.779	-3.84**	-1.96	-4.933***
Pakistan	3.596	-3.574***	1.747	-3.130**	-0.443	-4.848***	-2.31	-4.653***
Sri Lanka	0.191	-5.413***	0.189	-6.212***	-0.859	-2.795*	-0.79	-4.328

Note: *** Significance at 1%, ** Significance at 5%, * Significance at 10%. The second difference of variables is shown as D2.

Appendix 3. Summary of cross-country Granger Causality Test Results

Country	DCMP ↓ DCMC	DCMC ↓ DCMP	DCMP ↓ DGDP	DGDP ↓ DCMP	DCMP ↓ DTO	DTO ↓ DCMP
Bangladesh	0.24169	0.38537	1.179	0.21897	0.02355	0.97581
India	9.5108***	7.3828***	0.237	8.784***	1.135	15.437***
Nepal	1.4758	1.4682	1.7617	5.0066**	2.0242	0.86423
Pakistan	1.2561	0.47943	7.0856**	0.00591	0.42301	0.00936
Sri Lanka	1.4535	0.91049	1.3097	5.5625*	0.01055	2.1177

Note: The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. CMP, CMC, GDP, and TO refer to chicken meat production, chicken meat consumption, gross domestic product, and trade openness, respectively. DCMP, DCMC, DGDP, and DTO indicate the first-differenced forms of each variable.

Appendix 4. Robustness check; classified by countries

1 Bangladesh

Alternative lag 01

Lag Length Used		Alternative Lag 01
1	DCMP → DCMC	0.10337
	DCMC → DCMP	0.36078
1	DCMP → DGDP	0.45857
	DGDP → DCMP	0.00731
1	DCMP → DTO	0.13463
	DTO → DCMP	0.92581

Alternative lag 02

Lag Length Used		Alternative Lag 02
2	DCMP → DCMC	0.1218
	DCMC → DCMP	0.02145
2	DCMP → DGDP	0.18546
	DGDP → DCMP	0.05811
2	DCMP → DTO	0.0230
	DTO → DCMP	0.01568

2 India

Alternative lag 01

Lag Length Used		Alternative Lag 01
0	DCMP → DCMC	9.0945**
	DCMC → DCMP	8.4777**
0	DCMP → DGDP	2.6531
	DGDP → DCMP	18.668***
1	DCMP → DTO	0.60862
	DTO → DCMP	3.3177*

Alternative lag 02

Lag Length Used		Alternative Lag 02
2	DCMP → DCMC	0.09696
	DCMC → DCMP	0.06165
2	DCMP → DGDP	0.53409
	DGDP → DCMP	3.2825*
2	DCMP → DTO	1.2593
	DTO → DCMP	5.6325**

3 Nepal

Alternative lag 01

Lag Length Used		Alternative Lag 01
2	DCMP → DCMC	1.6315
	DCMC → DCMP	1.5266
1	DCMP → DGDP	1.1064
	DGDP → DCMP	0.03202
1	DCMP → DTO	0.14422
	DTO → DCMP	0.00224

Alternative lag 02

Lag Length Used		Alternative Lag 02
4	DCMP → DCMC	0.19122
	DCMC → DCMP	0.25075
3	DCMP → DGDP	0.44204
	DGDP → DCMP	6.6196***
2	DCMP → DTO	1.2307
	DTO → DCMP	0.79237

4 Pakistan

Alternative lag 01

Lag Length Used		Alternative Lag 01
0	DCMP → DCMC	20.634***
	DCMC → DCMP	1.1138
1	DCMP → DGDP	0.16332
	DGDP → DCMP	0.03288
2	DCMP → DTO	14.909***
	DTO → DCMP	0.48539

Alternative lag 02

Lag Length Used		Alternative Lag 02
2	DCMP → DCMC	18.102***
	DCMC → DCMP	0.93634
2	DCMP → DGDP	5.5788**
	DGDP → DCMP	0.00842
4	DCMP → DTO	0.10324
	DTO → DCMP	1.0236

5 Sri Lanka

Alternative lag 01

Lag Length Used		Alternative Lag 01
2	DCMP → DCMC	0.23629
	DCMC → DCMP	2.8243*
1	DCMP → DGDP	0.76411
	DGDP → DCMP	0.05355
1	DCMP → DTO	0.08688
	DTO → DCMP	1.9421

Alternative lag 02

Lag Length Used		Alternative Lag 02
4	DCMP → DCMC	0.21084
	DCMC → DCMP	0.31502
2	DCMP → DGDP	0.29557
	DGDP → DCMP	4.896**
2	DCMP → DTO	0.01408
	DTO → DCMP	0.1605