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BADEGGI JOURNAL OF AGRICULTURAL RESEARCH AND ENVIRONMENT, 2020, 02(02), 75 – 83

NCRI Press

Available online: www.ncribjare.org
ISSN: 2695-2122, e-ISSN: 2695-2114
DOI: https://doi.org/10.35849/BJARE202002018
Journal homepage: www.ncribjare.org



Research Article

Economic Analysis of Nigerian Live Ornamental Fish Export

Ambali, O. Y.[1], Ayinde, O. E.[2] and Sulaimon, T. T.[3]
[1]Department of Agricultural Economics and Extension Services, Kwara State University Malete, Nigeria.
[2]Department of Agricultural Economics and Farm Management, University of Ilorin, Nigeria
[3]Department of Economics and Development Studies, Kwara State University Malete
Correspondence e-mail: yusufolatunji@ymail.com

Abstract
Nigeria is undoubtedly endowed with mammoth species of ornamental fish that are of high premium and command a better price in the world market. Thus, this study examined the export of Nigerian live ornamental fish from economic stand point with the aims of evaluating the structural distribution of the commodity traded among the ornamental fish exporters, determining the profitability of ornamental fish export and examining the factors influencing ornamental fish trade at the firm level.The sampling frame for the study was the registered members of the Association of Ornamental fish Farmers and Exporters of Nigeria (AOFFEN). A random sampling technique was used to elicit data from the respondents in July 2017. Primary data were collected using well-structured questionnaires administered to 40 randomly selected respondents. Data were analysed using descriptive statistics, marketing margin analysis, return on investment, Lorenz curve, Gini coefficient and multiple regression analysis. Results of the analysis revealed that the estimated average marketing margin per box of ornamental fish export was $74.04 and the distribution of traded commodities among the fish exporters was oligopolistic with Gini coefficient of 0.75. Firm size, trading experience, number of countries traded with and number of commodities traded significantly (0<0.05) determined the level of export. From this study, it may be suggested that measures to create a more competitive market among live fish exporters should be put in place.

Keywords: *Economic, Analysis, Export, Ornamental, Fish*

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Introduction
Nigeria is naturally endowed with enormous species of ornamental fish which are highly demanded in the world market. Over the years, export of live fish in the country has been limited to ornamental fish (Areolu, 2004). These fish are small healthy fish exclusively used for ornamentation, decoration and exhibition. Though compare with other fishery and aqua culture subsectors, the production and trade of ornamental fish is relatively new in Nigeria. The practice of ornamental fish trade in the country started few decades ago when some American investors invested in the identification and location of various species of fish per water bodies (Areolu, 2007). In the beginning, the exploration of ornamental fish species was characterized by indiscriminate removal of the species from the wild but in recent time the Nigeria government has put in place some acts and regulations to cub such incessant action and encouraged the formation of the Association of Ornamental Fish Farmers and Exporters of Nigeria (AOFFEN). The acts and regulations amongst others include the Sea Fisheries (Licensing) Regulations of 1992, the Inland Fisheries Decree of 1992 and the Sea Fisheries Regulations of 1995.With the formation of AOFFEN, no individual is allowed to export ornamental fish without being a member of the association. According to Koroye (2010) about

Received on 25th August, 2020; Revised on 14th September, 2020; Accepted on 25th September, 2020; Published on 30th September, 2020

100 species of ornamental fishes have been identified to be regularly exported from Nigeria to the international market. Globally, the ornamental fish trade has become a multibillion dollar business (Rina and William, 2010). Since 1985, the worth of international trade in exports of ornamentals has remarkably increased at an average growth rate of about 14% per annum (FAO, 2013). Initially, ornamental fish keeping was considered as one of the attractive hobbies practiced in the developed countries but recently it is gaining recognition in developing countries too as they now account for more than half of the total export value (FAO, 2013). The stable increase in aquarium fish trade internationally has been credited to growing interest in ornamental fish production. According to MPEDA (2013), the whole ornamental fish industry, when non-exported product, retail sales and fish feed are considered, has been estimated to worth around US$15 billion. Livengood and Chapman (2009) stated that around 2000 species and millions of specimens are traded annually in the ornamental fish international market but only some 30 – 35 species of freshwater fish dominate the market. Currently Singapore, Malaysia, Hong Kong, Taiwan and Japan control about 60% of the world's ornamental fish product and export earnings. Nigeria's share of international ornamental fish trade is little compared to other developing countries like India and Singapore despite the enormous fishery resources. Studies on Nigerian live ornamental fish exist in literatures (Areolu, 2004; Ukaonu *et al.*, 2011 and Akinsorotan, 2017) but with little attentions on the economic aspect of the trade. Hence this study was to investigate the Nigerian ornamental fish export with the aims of evaluating the structural distribution of the commodity traded among Nigerian fish exporters, determining the profitability of ornamental fish export, and examining the factors influencing ornamental fish trade.

Materials and Methods

The study was carried out in Nigeria, located in the tropical zone of West Africa between latitudes 4°N and 14°N and longitudes 2°2I E and 14°30I E and has a total area of 923 770 km^2 out of which 910,768km^2 is land and 13,000km^2 is water (CIA, 2017). The country has a Coastline of 800 kilometers which extends from Ogun State to Cross Rivers State. It has Territorial (Marine) waters of thirty (30) nautical miles which came into operation in 1967 and the Exclusive Economic Zone (EEZ) which came to be under the Decree (Act) of 1978. The EEZ is described as an area extending from the external limits of the territorial waters of Nigeria up to a distance of two hundred (200) nautical miles from the baselines from which the breadth of the territorial waters of Nigeria is measured (World Bank, 2012).

The population for the study consisted of the registered members of ornamental fish exporters in Nigeria. Forty (40) respondents were randomly selected from the 65 registered Nigerian ornamental fish exporters. Data were collected through the use of questionnaires administered to the respondents. Data analyses were carried out using descriptive statistics, marketing margin analysis, return on investment, Lorenz curve, Gini coefficient and multiple regression analysis. The marketing margin analysis and return on investment were employed to elicit the profitability of varieties of exported ornamental fish. The cost components for the ornamental fish export include the cost of export services (air freight, packaging, inspection and certification) and cost of buying live ornamental fish. Returns from the export sale constitute the revenue. Marketing margin refers to the difference in prices paid for a commodity at different stages and different market level of a marketing system (Olukosi *et al*., 2012). Thus, marketing margin was calculated as the difference between total variable cost of exports incurred by exporters at their firm level and return from export proceeds at the international market. The total variable cost is the sum of cost of export services and the buying price of the ornamental fish. It is mathematically expressed as:

$$MM = TR - TVCE \quad \text{(1)}$$

$$TR = \sum P_i Q_i \quad \text{(2)}$$

$$TVCE = C_p + CES \quad \text{(3)}$$

Where

MM = Marketing margin ($/box), TR = Total Revenue ($/box), TVCE = Total variable cost of export ($/box), Pi = Unit cost of export quantity ($/box), Qi = quantity of export (box), CES = cost

of export service ($/box) and Cp = Cost price of export commodity ($/box).

It should be noted here that commodities traded at international live ornamental fish market were measured in box not in other conventional unit like kilogram or pounce. This box is special package for live fish trade and it is used as the standard of trade at the live fish market. Also, business transactions were made in US dollar (USD $) at the exchange rate of $1 to ₦385 as at July 2017.

Following Bakari and Ambali (2013), the return on investment which measures the rate at which capital invested yield profit is expressed as:
Return on investment = Total return ……... (4)

The Lorenz curve and Gini coefficient were used to examine the degree of concentration of commodity traded among the fish exporters. The curve was obtained by plotting the cumulative percentage of fish exporter from 0 – 100 on the horizontal axis against the corresponding cumulative percentage of the aggregate export values (in US $) of ornamental fish on the vertical axis. The wider the gap of the observed curve from the origin, the more unequal is the distribution of export.

Further analysis of structural distribution was carried out with Gini coefficient which is expressed in mathematical form as:
GC = 1-∑ L*CE…………………………..….. (5)

Where:
GC = Gini coefficient, L= Cumulative percentage of traders (exporter), CE = Cumulative percentage of total export. The value of GC ranged from 0-1 and the higher the value of GC, the higher the level of market imperfection.

Multiple regression models were used to examine the determinants of fish export performance. It is assumed that the export performance measured by the quantity of export commodities is strictly depended on some factors which include: traders' training experience in international trade, firm size, access to credit, number of fish species traded, number of country traded with, employment of oversea commissioners, partnership and production participation. Therefore, firm level export performance is explicitly stated as:

$$Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + e_t \ldots\ldots (6)$$

Where:
Y = quantity of fish exported at firm level (box)
X1 = traders' experience in international trade (years), X2 = firm size measured by the number of employee, X3 = international trade training (received training =1, otherwise = 0), X4 = access to credit(access =1, otherwise = 0), X5 = number of fish species traded (numbers), X6 = number of countries traded with, (numbers), X7= employment of oversea commissioners,(employed = 1, otherwise = 0), X8 = trade partnership (partnered = 1, otherwise = 0), X9 = production participation (participated in production = 1, otherwise = 0), bo =constant.et= error term, b1, b2, b3, ……… b9 are the respective coefficient of exogenous variables.

It is important to note that X5and X6 which represent the number of fish species traded and the number of countries traded with respectively constitutes the elements of diversification in trading. Thus, these terms are interchangeably used as diversification in the results and discussion.

Results and Discussion

Socio-economic characteristics of the live fish exporters

Table 1 presents the socio-economic characteristics of the Nigerian live fish exporters. The gender distribution of respondents indicates that all of the ornamental fish exporters were male. This implies that the ornamental fish export business was not gendered sensitive as it was purely undertaken by men. This could probably be attributed to the nature of activities involved in the business which women may find difficult to cope. Areolu (2004) reported that the activities associated with Nigerian ornamental fish export include offshore sourcing for live ornamental fish, holding of fish before export, local transportation, systematic packaging and handling of fish at airport among others. These activities make the

export business more masculine in nature and consequently result in the absence of female in the business. The age distribution of respondents concentrated within the age bracket of 41 – 60 years accounting for about 70% of the sampled respondents. The respondents' mean age of 51 years is an indication that the fish traders were moderately aged people. Things being equal, it is expected that a moderately aged person might have gathered enough capital and experience required to run a business. The finding is in tandem with that of Jaji and Odesola (2015) who reported that most of the people who involved in ornamental fish trade were averagely aged men who are vibrant and energetic to meet up with the tediousness and physical strength of the business, as well as the need to stay on-farm for days for holding of fish before export. The education level of respondents revealed that all the respondents were literate with at least primary education. 50% of them had passed through secondary school and about 40% possessed post-secondary school qualification. This result may stem from the fact that the operations of fish export are usually carried out in a formal setting which requires an individual to be learned and have special skill in international business. This result is similar to the findings by Jaji *et al.* (2015) where it was stated that level of education played a major role in the development of ornamental fish business. The study further revealed that larger proportion (52%) of the traders had their trading experience lying within 6-15 years and only 13% of them had trading experience of more than 20 years. The average trading experience of 11.9 years for the sampled respondents implies that the respondents had an appreciable experience in the business and this may have positive consequence on their trading activities. Houcine *et al.* (2007) opined that trading experience helps to reduce the uncertainties pertaining to trading activities and improves the skills and knowledge about the foreign market.

As indicated in the Table 1, more than half (62.50%) of the respondents had training experience in the international trade business. This implies that the fish traders are well enlightened about their business. It is expected that acquisition of training in international trade gives indication of practical experience which makes it possible for an individual trader to perform better in his business. This result is similar to the report by Juan (2016) where it was stated that training in international trade can substantially improve the ability of a trader in becoming a better exporter.

Costs of export services of live ornamental fish per box

The total cost of export services was $49.34 per box, out of which the cost of transportation which include the air freight and the cost of local transportation of fish from holding aquarium to the airport claims about 70%. This may not be surprising as transportation by air provides the only fastest transport service which reduces the risk of dead on arrival (DOA) at international market. Ranked next was the cost of packaging which accounts for about 19% of the total service costs. Other costs which include cost of electricity, medication and water supply claimed 2.01% of the total cost of export service while handling accounts for the least percentage (1.87%) of the cost of export services (Table 2).This agrees with the report of MPEDA (2013) that cost of shipping (air freight) constitute the bulk of export services in the ornamental fish export industries of many countries.

Profitability of live ornamental fish export per box

Table 3 showed the respective total cost of export (TC), total revenue (TR), marketing margin (MM), and return on investment (ROI) per unit box of ornamental fish export. The analysis revealed that total cost of export per box of ornamental fish ranged from $54.83 - $222.08 with mean value of $103.12 while the revenue from export proceed varied from $66.23 - $448.05 with an average value of $177.16. The ornamental fish traders exported an average of 32 boxes per month. On the account of profit accruable to various fish species, Lates recorded the highest market margin of $147.51 per box, followed by Puffer ($147.51) and Spiny eel ($141.56). On the average, a marketing margin of $74.04 was realized per unit box, indicating a high level of profitability. In terms of ROI, Lates recorded the highest value of 2.56, followed by polypterus, puffer and occellifer with respective scores of 2.42, 2.31 and 2.20. The mean value of

ROI was 1.67 which shows that the exporters realized an average value of $1.67 for every $1 invested. Generally all the live fish export ventures were profitable as the ROI values obtained were greater than 1. This is in consonance with Areolu (2007) and Koroye (2010) who found that ornamental fish business is a lucrative and highly profitable venture in Nigeria.

Market structure and trade concentration of ornamental fish export

The trade concentration of the fish export was determined by means of Lorenz schedule and Gini coefficient presented in Table 4 and 5 respectively. Table 4 shows the Lorenz schedule of the cumulative percentage of exported fish and the cumulative percentage of the fish exporters. It is evident from the analysis that there was high level of inequality in the distribution of commodity export among the Nigerian fish exporters. For instance, the first cumulative 70% of the total exporters accounted for only 6.3% of the total monthly fish export implying that the remaining cumulative 30% of them accounted for about 93.7% of the total monthly export. Furthermore, the larger 90% of the exporters handled about 41% of the aggregate export while the remaining 10% of them controlled about 59% of the total monthly export. Also, the result of inequality in trade shares by Gini coefficient (GC) as depicted in Table 10 was 0.75. This implies that the fish exporters operated in a highly concentrated market since the obtained GC value was more than 0.5 and tends toward one. In other words, the export supply of Nigeria fisheries was not competitive but rather oligopolistic as fewer numbers of the exporters handled the bulk of the exported fish and fishery products. This may be attributed to the fact that majority of the exporters who occupied the $1^{st} – 8^{th}$decile of the distribution operate at relatively small scale levels while the exporters that occupied the last 10^{th}decile operated at commercial level. The finding is in parity with the report of Yonas and Aemro (2019) that fish trade is typically oligopolistic in nature, controlled by few wholesalers who create capital barriers at the expense of small holders to massively enter into the fish trade.

Determinants of export performance of live ornamental fish

Results in Table 6 revealed that the determination coefficient (R^2) of the estimated function was 0.81, implying that 81% change in export supply by the Nigerian fishery firms was explained by its determinant. The 17.79 value of calculated F statistics also indicate the significance of model at 5% level of probability. The exporters' experience in international trade has a significant positive effect on export sales at 10% significant level. This implies that the more an individual firm gather experience over the years the better her export performance. Firm size, measured by the number of people employed by the firm, was positively and significantly related to the level of export at 1% probability level. This indicates that the larger the firm size, the higher the performance of a firm. In other words, a firm with larger numbers of employees benefit from economic of scale than those with smaller size. The finding is also in tandem with Marc and Gianmarco (2008) that firm size is thought to be useful measure of firm resources which in turn affect the trade performance. The estimated coefficient of exporters' training in international trade was positive but not significant. The positive sign supports the idea that a well-trained manager has the required skills to improve the performance of his business. The two variables of diversification, that is, the number of export destination countries and the number of fish species exported by the firms, were positively significant at 1% level of probability. This is in line with a priori expectation that firms that choose to diversify perform better than those that choose not to diversify their business. The use of over sea commission agents was negatively and insignificantly related to export level. This surprisingly suggests that firms that employed the service of over sea commissioners as part of their marketing strategies have lower performance than those that did not see it strategic to employ them. This finding may be attributed to the fact earlier advanced by Houcine *et al.* (2007) that commissioners are not usually pro-active in marketing and advertising the company products but are rather interested in completing the deal and taking care of paper work to finish the export transaction. Other variables such as firm's participation in fish production and enterprise

partnership jointly have direct but insignificant effect on the level of export sale.

Conclusion and Recommendations

Based on the findings of this study, it can be inferred that all the investigated live fish exports were profitable with a minimum ROI of 1.15. Live fish trade was highly concentrated (oligopolistic) in terms of structural distribution of traded commodities among the Nigerian exporters. Traders' experience, firm size and market diversification were shown to be important factors in enhancing export trade performance of domestic ornamental fish firms.

In order to break the observed oligopolistic export market and ensure more competitive market, government should promote ornamental fish export through the provision of financial incentives such as export promotion grant and export stabilization fund to the small fish export firms. This will allow the small firms to be at par with large scale firms and thereby allow for more competitive market instead of the observed oligopolistic export market.

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Table 1: Distribution of respondents by socio-economic characteristics

Characteristics	Category	Freq.	Percentage	Mean
Gender	Male	40	100	
	Female	0	0	
	Total	40	100	
Age (yrs)	31-40	5	12.50	
	41-50	13	32.50	50.60
	51-60	15	37.50	
	≥ 61	7	17.50	
	Total	40	100	
Education	Primary	4	10.00	
	Secondary	20	50.00	
	Tertiary	16	40.00	
	Total	40	100.00	
Trade experience (yrs)	1-5	8	20.00	
	6 – 10	12	30.00	
	11-15	9	22.50	11.9
	16-20	6	15.00	
	≥20	5	12.50	
	Total	40	100.00	
Trade training	Trained	25	62.50	
	Not trained	15	37.50	
	Total	40	100.00	

Source: Field Survey, 2017 Exchange rate, $1USD = ₦385

Table 2: Average cost of export service per box of life ornamental fish

Cost Item	Average cost ($/ box)	% of service cost
Local transportation	0.53	1.10
Air freight	34.02	68.96
Packaging	9.22	18.70
Certification	3.64	7..37
Handling labour	0.92	1.87
Other(electricity,fish medication and water supply)	1.00	2.01
Total Cost	49.34	100.00

Source: Field Survey, 2017 Exchange rate, $1USD = ₦385

Table 3: Analysis of profitability of live ornamental fish export

Fish Species	TC ($/box)	TR ($/box)	MM ($/box)	ROI
Lates	175.22	448.05	272.83	2.56
Polypterus common	86.00	207.79	121.79	2.42
Puffer	112.24	259.74	147.51	2.31
Occellifer	94.60	207.79	113.19	2.20
Red eyes	93.87	194.81	100.93	2.08
Arowana	95.59	194.81	99.22	2.04
Kribensis	136.39	259.74	123.35	1.90
Polyteruspalmas	87.38	155.84	68.47	1.78
Blue fish	178.21	311.69	133.48	1.75
Leaf fish	92.11	155.84	63.74	1.69
Mudskippers	81.79	136.36	54.57	1.67
Lamp eyes	188.34	311.69	123.35	1.65
Spiny eel	222.08	363.64	141.56	1.64
Spotted cat	95.32	155.84	60.52	1.63
Moon fish	124.18	194.81	70.62	1.57
Short nose	66.52	103.90	37.38	1.56
Lussosso	100.81	155.84	55.04	1.55
Glass catfish	100.29	155.84	55.56	1.55
Alestes	77.43	116.88	39.45	1.51
Congo Tetra	77.69	116.88	39.19	1.50
Elephant nose	69.12	103.90	34.78	1.50
Jewel fish	91.33	129.87	38.54	1.42
Debauwie	85.48	116.88	31.40	1.37
Aluminium catfish	71.77	97.40	25.64	1.36
Bush fish	121.33	155.84	34.52	1.28
Reed	70.99	90.91	19.92	1.28
Marble Knife	71.64	90.91	19.27	1.27
Barbs	54.83	66.23	11.40	1.21
Butterfly fish	67.84	77.92	10.08	1.15
Mean	103.12	177.16	74.04	1.67
Minimum	54.83	66.23	10.08	1.15
Maximum	222.08	448.05	272.83	2.56
Average Export per Month	32 boxes			

Source: Field Survey, 2017 Exchange rate, $1USD = ₦385 MM = Marketing margin, TR = Total Revenue
TC = Total cost of export

Table 4: Lorenz curve schedule for distribution of export of fish

Exporters (%)	Cumulative % of exporters	Export value (000$)	Export (%)	Cumulative % of export
1st decile	10	50.09	0.47	0.47
2nd decile	20	62.59	0.58	1.05
3rd decile	30	70.09	0.65	1.70
4th decile	40	85.14	0.80	2.50
5th decile	50	100.18	0.94	3.44
6th decile	60	145.25	1.36	4.80
7th decile	70	165.28	1.54	6.34
8th decile	80	643.57	6.01	12.35
9th decile	90	3013.85	28.16	40.51
10th decile	100	6366.42	59.49	100.00
Total	100	10702.46	100.00	100.00

Source: Field Survey, 2017 Exchange rate, $1USD = ₦385

Table 5: Analysis of Gini coefficient for distribution of ornamental fish export

Percentage of exporters (X)	Cum.% of exporters (X_i)	Export % (Y)	Cum.% of export (Y_i)	Paired sum of (Y_i) (a)	Trapezoidal area(X) x (a) (b)
1st decile	10	0.47	0.47	0.47	4.70
2nd decile	20	0.58	1.05	1.52	15.20
3rd decile	30	0.65	1.70	2.75	27.50
4th decile	40	0.80	2.50	4.20	42.00
5th decile	50	0.94	3.44	5.94	59.40
6th decile	60	1.36	4.80	8.24	82.40
7th decile	70	1.54	6.34	11.14	111.40
8th decile	80	6.01	12.35	18.69	186.90
9th decile	90	28.16	40.51	52.86	528.60
10th decile	100	59.49	100.00	140.51	1405.10
Total				246.32	2463.2

Gini Coefficient = 1- 2463.2/10000 = 0.75, Source: Field Survey, 2017

Table 6: Determinants of export performance of live ornamental fish

Variables	Coefficient	Std. Error	t-ratio	p-value	
Const	6.74	0.53	12.77	0.0001	
X_1(experience)	0.05	0.03	2.00	0.0524	*
X_2(size)	0.48	0.09	4.98	0.0001	***
X_3(training)	0.12	0.31	0.39	0.7025	
X_4(credit access)	0.07	0.11	0.64	0.5269	
X_5(fish type)	0.09	0.03	2.85	0.0071	***
X_6(number of countries)	1.53	0.44	3.46	0.0014	***
X_7(commissioners)	-0.08	0.31	- 0.25	0.8078	
X_8(partnership)	0.56	0.36	1.56	0.1279	
X_9 (production participation)	0.04	0.30	0.12	0.9027	
R^2	0.81				
F-value	17.97				

Source: Field survey 2017 ***= significant at 10%, *** = 1% levels respectively**

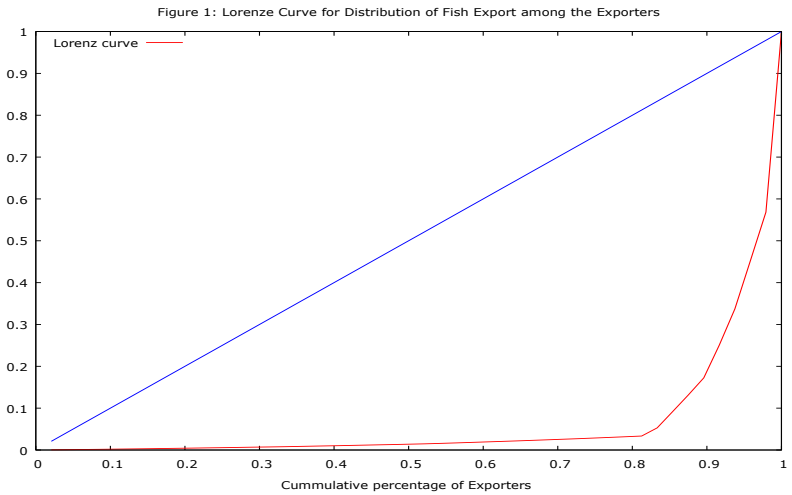


Figure 1: Lorenz curve for distribution of ornamental fish export

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