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ECONOMIC ANALYSIS OF EGG-PRODUCING ENTERPRISES IN TÜRKIYE

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Abstract

This study aims to examine the economic structure and performance of egg-producing poultry farms in Türkiye. A total of 68 farms operating in the provinces of Afyonkarahisar, Konya, Manisa, Antalya, Burdur, and Isparta were evaluated in five groups according to flock size; the data cover the 2022 production season. The majority of farm owners have a high school or higher education level, and their experience plays a determining role in profitability and production management. As farm scale increases, the adoption of modern production systems (88.24% enriched cages), the rate of organisation (77.9%), and profitability also increase. Feed costs constitute the most significant portion of production expenses (67.05%), with an average unit egg cost of 1.27 TRY and a selling price of 1.55 TRY. Small farms still face limitations in cost management and access to financial resources. The findings indicate that economies of scale, modern production systems, and effective cost management are critical for profitability. To achieve sustainable profitability, strategies such as improving feed efficiency, encouraging organisation, expanding modern cage systems, and facilitating financial access are recommended.

Key words**:** *egg production, economic analysis, production cost, Turkiye*

INTRODUCTION

Poultry farming has historically been an important component of Turkish agriculture. Historical records indicate that the Ottoman Empire was among the entities exporting eggs. However, over time, the sector lagged behind developed countries due to insufficient adaptation to technological and industrial advancements [17].

The more and more increased demand for eggs and meat due to the high protein content as needed by consumers [7] has led to significant industrialisation in Turkish poultry farming which began during the planned development period of the 1960s, with the importation of hybrid parent stocks authorised in 1963. From the 1970s onwards, the increase in private sector investments contributed substantially to the sector's development [14].

With the advancement of modern agricultural techniques and the transition from extensive to intensive farming methods, the importance of enterprises suitable for industrial agriculture has increased. In this context, egg production stands out as a sector in which modern techniques can be more easily applied, climatic factors can be controlled, and production sustainability can be ensured.

Today, egg poultry farming has become a sector that continuously improves in terms of production, efficiency, and exports, thereby making a significant contribution to the Turkish economy [12][5]. Nevertheless, high production costs, the elevated prices of key inputs, and seasonal price fluctuations remain significant challenges limiting the sector's development [11].

Studies on the economic structure of egg production enterprises indicate that feed costs constitute a significant proportion of total expenses. Research has shown that large-scale enterprises have advantages over smaller ones in both production efficiency and profitability [6][14][3]. High input costs, in particular, restrict the economic performance of small- and medium-sized enterprises [8][16]. Some studies report that enterprises starting with pullets incur higher costs and achieve lower

gross profits [10], whereas even large enterprises, despite more rational operations, may fail to reach optimal factor utilisation [13]. These findings highlight the critical role of enterprise size and cost management in determining profitability in the egg poultry sector.

This study aims to analyse the economic structure of egg-producing enterprises in Türkiye, compare their performance, and provide insights that can guide investors, producers, and policymakers.

MATERIALS AND METHODS

The primary material of the study consisted of face-to-face survey data, for the 2022 production period, collected from farms operating in Afyonkarahisar, Konya, Manisa, Antalya, Burdur, and Isparta, which together account for 32.92% of Türkiye's layer poultry production. Farm records were obtained from the relevant Provincial Directorates of Agriculture and Forestry, and the Central Union of Egg Producers, while secondary data were sourced from FAO, TURKSTAT (TÜİK) [18], and the existing literature.

Since it was not possible to reach all farms comprising the target population, Stratified Sampling was employed, with strata allocation determined using the Neyman method. The sample size was calculated as 68 farms, based on a 99% confidence level and a 5% margin of error. The farms were categorised into five groups according to the number of laying hens they possessed (Table 1).

Table 1. Distribution of sampled enterprises

Group (Number of Laying Hens)	n
Group I (1–25,000)	13
Group II (25,001–75,000)	11
Group III (75,001–150,000)	12
Group IV (150,001–250,000)	8
Group V (250,001 and above)	24
Total	68

Source: Own calculation.

In the data analysis, Absolute Profit, Relative Profit, Gross Profit, and Gross Production Value were calculated. In addition, the production and feed performance indicators of the enterprises, as well as their socio-economic characteristics (such as education level, work experience, credit utilisation, and organisational membership), were evaluated.

RESULTS AND DISCUSSIONS

Among the enterprise owners, 11.76% had primary education, 14.71% had secondary education, 38.24% had a high school diploma, 13.24% had an associate degree, and 22.06% held a bachelor's degree. This indicates that all enterprise owners possessed at least one diploma (Table 2). The relatively high level of education provides a significant advantage in terms of adopting modern production techniques and keeping up with sectoral developments.

Similarly, Doğan [8] in Konya and Turhan [16] in Akçakoca reported that the majority of enterprise owners, in their studies, were diploma holders. Therefore, the educational level of producers in the sector is generally high.

In conclusion, enterprises with higher educational levels are likely to make more informed decisions, be more open to innovations, and maintain a stronger position in terms of sustainability.

Table 2. Educational levels of farm owners

Educational Level	Farm Scale					Total	Percentage (%)
	I	II	III	IV	V		
Primary School	4	2	2	0	0	8	11.76
Middle School	5	1	2	1	1	10	14.71
High School	3	6	4	3	10	26	38.24
Associate Degree	1	1	2	0	5	9	13.24
Bachelor's Degree	0	1	2	4	8	15	22.06
Total	13	11	12	8	24	68	100.00

Source: Own calculation.

When evaluating the work experience of the enterprise owners included in the study, the majority possess long-standing experience. Specifically, 44.12% of the owners have 31 years or more, 27.94% have 21–30 years, 14.71% have 11–20 years, and 13.24% have 1–10 years of experience (Table 3). This indicates that experience is prevalent in the management of enterprises operating in the sector. Similar findings have also been reported in the literature. For instance, Sarıözkan [14] determined that a large proportion of owners in enterprises located in Afyonkarahisar had 11

years or more of experience. In light of these findings, it can be suggested that the experience of enterprise owners in the egg poultry sector may have positive effects on business management and production performance.

When examining the reasons why farm owners engage in egg poultry farming, it was found that 52.94% pursued it for profit, 13.24% as a secondary occupation, and 33.82% due to the lack of alternative employment opportunities (Table 4). Similar findings have been reported in the literature. For instance, Doğan [8], in his study conducted in Konya, indicated that the majority of farm owners produced either as part of a family business or for profit. In contrast, Sarıözkan [14], in a study carried out in Afyonkarahisar, observed that a significant portion of enterprises engaged in egg poultry farming due to secondary income needs or limited alternatives. These findings suggest that egg poultry farming is influenced both by the potential for economic gain and by the scarcity of alternative employment opportunities, providing an important indicator for understanding sectoral preferences.

Table 3. Work experience of farm owners (years)

Experience (years)	Farm scale										Total	
	I		II		III		IV		V			
	N	%	N	%	N	%	N	%	N	%	N	%
1-10	2	15.38	1	9.09	2	16.67	1	12.50	3	12.50	9	13.24
11-20	1	7.69	2	18.18	2	16.67	3	37.50	2	8.33	10	14.71
21-30	4	30.77	4	36.36	3	25.00	1	12.50	7	29.17	19	27.94
31 and over	6	46.15	4	36.36	5	41.67	3	37.50	12	50.00	30	44.12
Total	13	100.00	11	100.00	12	100.00	8	100.00	24	100.00	68	100.00

Source: Own calculation.

Table 4. Reasons for engaging in egg production

Reason for engaging in egg production	I		II		III		IV		V		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Profitability	5	38.46	6	54.55	8	66.67	3	37.50	14	58.33	36	52.94
Secondary job	2	15.38	1	9.09	1	8.33	2	25.00	3	12.50	9	13.24
Lack of alternative job opportunities	6	46.15	4	36.36	3	25.00	3	37.50	7	29.17	23	33.82
Total	13	100.00	11	100.00	12	100.00	8	100.00	24	100.00	68	100.00

Source: Own calculation.

The majority of the 68 enterprises included in the study (77.9%) were found to be members of agricultural producer organisations. The highest rate of organisation membership was observed in group III and group V enterprises at 91.67% (Table 5). Similar studies also indicate that the sector is considerably organised [8][14]. This finding suggests that egg-producing poultry enterprises have the potential to enhance knowledge sharing, marketing, and production processes through organisational participation.

The findings regarding credit usage during the establishment phase of the enterprises indicated a relationship between scale size and financing preferences. The credit utilisation rates of small-scale enterprises in Groups I and II were 30.77% and 36.36%, respectively, whereas this rate increased to 58.33% and 62.50% in Groups III and V. In Group IV, the credit utilisation rate was determined to be 37.50%. Overall, 48.53% of the 68 enterprises surveyed used credit at the establishment stage, while 51.47% did not (Table 6). This suggests that larger-scale enterprises tend to meet their initial financing needs through credit, highlighting the effect of scale size on access to financial resources.

In the examined enterprises, the majority of egg production (88.24%) was carried out in enriched cage systems, while the remaining 11.76% was produced using conventional cage systems (Table 7). This indicates that most enterprises prefer production systems based on

modern technology and are taking steps to improve both production efficiency and animal welfare. Although the use of conventional cages is relatively higher in small-scale enterprises, the overall trend favours modern systems.

Table 5. Organisation membership status of enterprises

Enterprise scale	Organisation membership status				Total	
	Yes	%	No	%	N	%
I	7	53.85	6	46.15	13	100.00
II	10	90.91	1	9.09	11	100.00
III	11	91.67	1	8.33	12	100.00
IV	3	37.50	5	62.50	8	100.00
V	22	91.67	2	8.33	24	100.00
Total	53	77.94	15	22.06	68	100.00

Source: Own calculation.

Table 6. Organisation membership status of enterprises

Enterprise scale	Use of establishment credit				Total	
	Yes	%	No	%	N	%
I	4	30.77	9	69.23	13	100.00
II	4	36.36	7	63.64	11	100.00
III	7	58.33	5	41.67	12	100.00
IV	3	37.50	5	62.50	8	100.00
V	15	62.50	9	37.50	24	100.00
Total	33	48.53	35	51.47	68	100.00

Source: Own calculation.

Table 7. Rearing systems applied in enterprises

Enterprise scale	Rearing system				Total	
	Cage	%	Enriched cage	%	N	%
I	1	7.69	12	92.31	13	100.00
II	0	0.00	11	100.00	11	100.00
III	0	0.00	12	100.00	12	100.00
IV	2	25.00	6	75.00	8	100.00
V	5	20.83	19	79.17	24	100.00
Total	**8**	11.76	**60**	88.24	**68**	100.00

Source: Own calculation.

The majority of the workforce in the enterprises consisted of men (60.78%), while women accounted for a lower proportion (39.22%). The proportion of men varied between 50.96% and 68.53% across the enterprise groups (Table 8). This finding is consistent with similar studies in the literature and indicates that male labour still predominates in egg production enterprises [2][8].

47.06% of the surveyed enterprises implemented mandatory moulting, while 52.94% did not. Among the enterprise groups, this rate was highest in group III (66.67%) and lowest in group I (7.69%) (Table 9). Enterprises resort to moulting to reduce costs and increase profit margins during periods when the prices of pullets and chicks are high. Similarly, Sarıözkan [14] reported that 35% of enterprises in Afyonkarahisar practised moulting. These findings indicate that enterprise scale and economic conditions influence the implementation of moulting practices.

Table 8. Number and proportion of the workforce in enterprises

Enterprise scale	Male		Female		Total	
	N	%	N	%	N	%
I	142	59.41	97	40.59	239	100.00
II	141	59.49	96	40.51	237	100.00
III	135	68.53	62	31.47	197	100.00
IV	53	50.96	51	49.04	104	100.00
V	183	61.20	116	38.80	299	100.00
Total	654	60.78	422	39.22	1076	100.00

Source: Own calculation.

Table 9. Status of mandatory moulting in enterprises

Enterprise scale	Mandatory moulting				Total	
	Yes	%	No	%	N	%
I	1	7.69	12	92.31	13	100.00
II	4	36.36	7	63.64	11	100.00
III	8	66.67	4	33.33	12	100.00
IV	4	50.00	4	50.00	8	100.00
V	15	62.50	9	37.50	24	100.00
Total	32	47.06	36	52.94	**68**	100.00

Source: Own calculation.

Cost components in egg poultry farming

In the examined farms, total production costs were determined as 112,013,000 TRY, of which 85.34% were variable costs and 14.66% were fixed costs. Among these expenses, feed costs accounted for the largest share at 67.05%, followed by marketing costs at 10.14%, pul (day-old chick) depreciation at 8.45%, and tray (packaging) costs at 4.17%. When analysed by group, feed costs ranged from 65.42% in group I to 67.31% in Group V. Marketing, plant depreciation, and packaging costs also held significant shares within total costs (Table 10). Similar studies have shown that feed costs constitute the most significant portion of total production costs [1][14][8][13][6]. These findings indicate that managing feed costs is the most critical factor in reducing expenses in egg production. In conclusion, feed, marketing, fuel, and packaging expenses are of primary importance in farm cost management.

Table 10. Production costs and their distribution in the examined enterprises

Cost Items	I	II	III	IV	V	Average
Total Feed Cost	5,088,148	15,987,396	34,532,832	49,313,994	168,994,349	75,099,670
Temporary Labour Cost	1,443	16,039	12,510	21,341	46,505	24,002
Veterinary & Health Cost	192,482	480,368	810,016	1,145,499	3,324,076	1,565,416
Tray (Packaging) Cost	238,376	941,681	2,011,443	3,032,105	10,662,781	4,672,916
Electricity Cost	94,327	259,289	429,968	671,765	1,948,477	902,583
Marketing Cost	598,914	2,510,679	5,580,090	7,714,816	25,354,168	11,361,514
Moulting Period Cost	5,600	274,044	832,745	956,895	4,084,480	1,746,514
Repair & Maintenance (Equipment & Machinery)	47,258	66,825	92,177	115,979	252,917	139,021
Other Expenses (Cleaning, Fire Safety, etc.)	30,368	70,833	67,090	58,399	139,879	85,343
A- Total Variable Costs	**6,296,915**	**20,607,154**	**44,368,871**	**63,030,793**	**214,807,632**	**95,596,979**
General Administrative Expenses (3% of A)	188,907	618,215	1,331,066	1,890,924	6,444,229	2,867,909
Permanent Labor	252,923	504,709	786,750	1,212,375	2,773,700	1,390,421
Pul Depreciation	702,107	1,977,115	4,094,059	6,429,648	21,337,582	9,463,875
Pul Capital Interest	26,696	94,160	207,031	324,556	1,090,776	480,033
Depreciation (Building, Equipment & Machinery)	302,051	644,218	1,295,517	1,491,600	4,515,467	2,159,754
Capital Interest (Building, Equipment & Machinery)	7,551	16,105	32,388	37,290	112,887	53,994
B- Total Fixed Costs	**1,480,236**	**3,854,522**	**7,746,811**	**11,386,393**	**36,274,641**	**16,415,986**
Total Production Cost (A + B)	**7,777,150**	**24,461,675**	**52,115,681**	**74,417,187**	**251,082,272**	**112,012,965**
	Share (%)					
Total Feed Cost	65.42	65.36	66.26	66.27	67.31	67.05
Temporary Labour Cost	0.02	0.07	0.02	0.03	0.02	0.02
Veterinary & Health Cost	2.47	1.96	1.55	1.54	1.32	1.40
Tray (Packaging) Cost	3.07	3.85	3.86	4.07	4.25	4.17
Electricity Cost	1.21	1.06	0.83	0.90	0.78	0.81
Marketing Cost	7.70	10.26	10.71	10.37	10.10	10.14
Moulting Period Cost	0.07	1.12	1.60	1.29	1.63	1.56
Repair & Maintenance	0.61	0.27	0.18	0.16	0.10	0.12
Other Expenses	0.39	0.29	0.13	0.08	0.06	0.08
A- Total Variable Costs	**80.97**	**84.24**	**85.14**	**84.70**	**85.55**	**85.34**
General Administrative Expenses	2.43	2.53	2.55	2.54	2.57	2.56
Permanent Labor	3.25	2.06	1.51	1.63	1.10	1.24
Pul Depreciation	9.03	8.08	7.86	8.64	8.50	8.45
Pul Capital Interest	0.34	0.38	0.40	0.44	0.43	0.43
Depreciation (Building, Equipment & Machinery)	3.88	2.63	2.49	2.00	1.80	1.93
Capital Interest (Building, Equipment & Machinery)	0.10	0.07	0.06	0.05	0.04	0.05
B- Total Fixed Costs	**19.03**	**15.76**	**14.86**	**15.30**	**14.45**	**14.66**
Total Production Cost (A + B)	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: Own calculation *1 USD = 16.62 TRY for 2022 year

Annual performance results of egg-laying poultry farms

In the examined farms, the gross production value increased with the scale of the enterprise, achieving an average of 135.95 million TRY.

The majority of the income (97.33%) was obtained from egg sales, while the shares of culled chickens and manure sales were 1.95% and 0.73%, respectively (Table 11). These findings indicate that as the farm size increases, revenues from egg sales rise, and marketing-related problems decrease. Similarly, Şahin and Yıldırım [15], Bayaner [4], Durrani [9], and Demircan et al. [6] also reported that the majority of gross production value was derived from egg sales.

Table 11. Sales revenues of the examined enterprises

Revenue components	I	II	III	IV	V	Average
A - Egg Sales Revenue	6,902,803	24,306,935	55,547,630	90,529,701	316,677,838	132,312,165
B - Cull Chicken Sales Revenue	107,257	525,023	1,193,599	1,920,017	5,964,476	2,647,064
C - Fertiliser Sales Revenue	44,255	208,450	449,442	667,641	2,234,091	988,542
Gross Production Value (GPV) (A+B+C)	**7,054,315**	**25,040,408**	**57,190,671**	**93,117,359**	**324,876,405**	**135,947,771**
Share (%)						
A - Egg Sales Revenue	97.85	97.07	97.13	97.22	97.48	97.33
B - Cull Chicken Sales Revenue	1.52	2.10	2.09	2.06	1.84	1.95
C - Fertiliser Sales Revenue	0.63	0.83	0.79	0.72	0.69	0.73
Gross Production Value (GPV) (A+B+C)	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: Own calculation.

According to Table 12, the average gross profit per enterprise was calculated as 40,350,792 TRY, the net profit as 23,934,806 TRY, and the relative profit as 1.21. The gross and net profit per chicken were 140 TRY and 83 TRY, respectively. The gross and net profits of the first group of enterprises were significantly lower than those of the other groups, while the fifth group exhibited the highest profit levels. This observation indicates that profitability increased with production scale. Therefore, egg production was economically profitable for all enterprises except those in the first group. At this point, enterprise size and efficient management emerge as the primary factors determining profitability in the sector.

Table 12. Organisation membership status of enterprises

Indicators (TRY per enterprise)	I	II	III	IV	V	Average
A – Gross Production Value (GPV)	7,054,315	25,040,408	57,190,671	93,117,359	324,876,405	135,947,771
B – Total Variable Costs (TRY/Year)	6,296,915	20,607,154	44,368,871	63,030,793	214,807,632	95,596,979
C – Total Production Costs	7,777,150	24,461,675	52,115,681	74,417,187	251,082,272	112,012,965
Gross Profit (A–B)	757,401	4,433,254	12,821,800	30,086,566	110,068,773	40,350,792
Net Profit (A–C)	-722,835	578,732	5,074,990	18,700,173	73,794,133	23,934,806
Relative Profit (A/C)	0.91	1.02	1.10	1.25	1.29	1.21
Indicators (TRY per chicken)						
A – Gross Production Value (GPV)	415	440	460	486	495	471
B – Total Variable Costs (TRY/Year)	371	362	357	329	327	331
C – Total Production Costs	458	430	419	389	382	388
Gross Profit (A–B)	45	78	103	157	168	140
Net Profit (A–C)	-43	10	41	98	112	83
Relative Profit (A/C)	0.91	1.02	1.10	1.25	1.29	1.21

Source: Own calculation.

Egg production costs in the examined enterprises

In the examined enterprises, the unit cost of egg production was calculated by dividing the total production expenses, after subtracting secondary incomes, by the total number of eggs produced. On average, 85,120,409 eggs were produced per enterprise, with total production costs of 112,012,965 TRY, and total secondary income of 3,635,606 TRY. Accordingly, the cost per egg was determined as 1.27 TRY (Table 13).

In the study conducted by Doğan [8], the unit cost of eggs was found to be 0.21 TRY. The

primary reason for the difference between that study and the current one is the 439% increase in inflation during the 2017–2022 period, which significantly raised production costs. This finding is consistent with studies that take temporal cost variations into account.

In light of production costs, the average selling prices per egg were determined as 1.55 TRY in the enterprises, 1.65 TRY in public markets, and 1.76 TRY in retail stores (Table 13). Accordingly, the profit margin per egg was 0.28 TRY on average at the enterprise level, 0.38 TRY in public markets, and 0.49 TRY in retail stores (Table 13). These findings indicate the impact of different marketing channels on pricing and profitability and show that production costs can be balanced with sales strategies.

Table 13. Unit egg production cost in the examined farms

Indicators	I	II	III	IV	V	Average
A-Total Production Cost (TRY)	**7,777,150**	**24,461,675**	**52,115,681**	**74,417,187**	**251,082,272**	**112,012,965**
k-Cull Chicken Sales Revenue (TRY)	107,257	525,023	1,193,599	1,920,017	5,964,476	2,647,064
m-Manure Sales Revenue (TRY)	44,255	208,450	449,442	667,641	2,234,091	988,542
B-Total Secondary Revenue (k+m) (TRY)	**151,512**	**733,473**	**1,643,041**	**2,587,659**	**8,198,567**	**3,635,606**
C-Egg Production (units/year)	4,747,960	16,453,925	35,933,777	56,142,450	194,380,259	85,120,409
D-Egg Cost (TRY/unit) [(A-B)/C]	**1.61**	**1.44**	**1.40**	**1.28**	**1.25**	**1.27**
E-Selling Price (TRY/unit)	1.45	1.48	1.55	1.61	1.63	1.55
H-Profit Margin (TRY/unit) (E-D)	**-0.15**	**0.04**	**0.14**	**0.33**	**0.38**	**0.28**

Source: Own calculation

CONCLUSIONS

The poultry egg production enterprises examined in this study are generally managed by owners with a high level of education and extensive industry experience. As the scale of the enterprises increases, management experience, use of modern production systems, and profitability levels also rise. The analyses indicate that a significant portion of production costs originates from feed expenses, directly impacting enterprise profitability.

Furthermore, the widespread use of enriched cage systems and the fact that a large proportion of enterprises are members of agricultural organisations highlight the sector's high potential for technological adoption and knowledge sharing.

Economic analyses demonstrate that economies of scale in egg production enhance profitability and that positive profit margins are achievable when production costs are balanced with sales prices.

However, cost management and access to financial resources remain limited in small-scale enterprises.

Based on these findings, the following recommendations are proposed:

(i) Feed Management and Cost Control: Given the high share of feed expenses in total production costs, adopting practices that improve feed efficiency and implementing cost-effective procurement strategies are recommended.

(ii) Organisation and Knowledge Sharing: Encouraging membership in agricultural producer organisations can enhance enterprise capacity in terms of production efficiency, marketing, and application of modern technologies.

(iii) Promotion of Modern Production Systems: Encouraging the use of enriched cage systems instead of conventional cages in small-scale enterprises can improve both animal welfare and production efficiency.

(iv) Access to Financial Resources: Facilitating access to credit and financial instruments for small-scale enterprises can reduce initial investment costs and contribute to achieving economies of scale.

(v) Diversification of Marketing Channels: Utilising diverse sales channels may positively influence product pricing and profit margins; therefore, enterprises are encouraged to diversify their marketing strategies.

In conclusion, the egg production sector has the potential to achieve sustainable profitability under the leadership of educated and experienced producers, through economies

of scale, modern production systems, and effective cost management.

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