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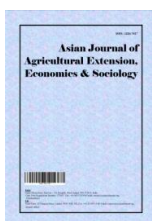
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## **Economic Valuation of Backyard Duck Rearing in the Border Covering District Households of Vembanad Lake – Market Price Approach**

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### **Authors' contributions**

*This work was carried out by the author VC such as design of the study, performed the statistical analysis and wrote the first draft of the manuscript. Further, I would like to inform that, it is part of my PhD research work topic "Economic valuation of Vembanad estuarine ecosystem of Kerala in relation to Fisheries". All other authors are my advisory members were read and approved the final manuscript.*

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### **ABSTRACT**

The Vembanad lake provides various provisional services which are directly used for consumption through various means like fishing, aquaculture, paddy cultivation, duck farming etc. In this study, the economic valuation of duck rearing activities practiced by the 30 sample households situated in around three districts bordering Vembanad lake namely Ernakulam, Alappuzha and Kottayam districts were used for the estimation. This study used to estimate the economic value generated by duck rearing using market price method was about INR 27.62 crores, out of which the value

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generated from the egg and duck (meat) was about INR 15.43 and INR 12.18 crores respectively. In the process of estimation used the variable from the sample household as such as number of ducks reared, egg produced annually and selling price of duck egg and meat in local markets.

**Keywords:** Duck rearing; economic valuation; market price method; desi breed; improved breed.

## 1. INTRODUCTION

Kerala is gifted with fresh water lakes and backwaters, rearing of duck make effectively utilizing of backyard households situated around the water bodies. The rearing of duck which effectively utilized the natural water bodies and also considered as important source of income as well as generate employment to the poor households [1]. Vembanad lake is one of the largest lakes situated in the Kerala, covering three districts namely Ernakulum (EKM), Alappuzha (ALPY) and Kottayam (KTYM). Duck rearing is an important economic activity followed as a backyard farming method of many households situated around the Vembanad lake and is considered as an additional income generating livelihood activity [2]. Alappuzha district alone has 26% of total duck population of Kerala and the Kuttanad area in this district is considered as a major duck rearing area. The two major breeds farmed are i.e., *Chara* and *Chemballi* which are most preferred locally [3].

Duck rearing is a lucrative livestock industry as it requires less labour for supervision [4], Farmers only need to ensure night shelter and nest for laying eggs. Duck is also resistance to various common avian diseases and the size of the duck egg is more than hen egg by 10 to 15 gm in terms its weight [5].

In the Kerala the duck population contribute only 5.14 percentage of the total poultry population. There are two types of duck breeds i.e Desi (Kuttanad breeds) and improved breeds both with 50% of each type being reared in the Vembanad area. The rearing of duck is mainly for meat and egg which has good demand. Duck eggs are comparatively bigger in size and is considered to be tastier and having high nutritional value. The supply of duck eggs and meat is comparatively lower than chicken eggs and meat and hence fetches higher prices.

Farmers practice duck herding in their harvested paddy field, and this system of herding duck in the fields were predominantly followed in the southern part of Vembanad where below sea level paddy farming is undertaken. In the paddy field, ducks forage for feed such as insects,

snails, clams, small fishes and feed on the left-out paddy grains as well as clams and small fishes etc. Duck grows faster in the paddy field and in turn it controls the weed growth in paddy field by stirring of water and duck dropping makes paddy field more fertile there is thus symbiotic effect [6].

Duck also required very little quantity of supplement feed available at low cost such as fresh domestic waste, fresh prawn waste (FPW), rice bran, broken rice and pulses etc. Normally the FPW is generated as waste from peeling shed and pre-processing plants situated in the region which would otherwise cause environmental pollution. The feeding rate of FPW is 230-250 g/day/duck. Broken rice grain is fed at the rate of 94-100 g/day/duck. FPW gives salmon red colour to the yolk (due to the xanthene pigment) [7]. All together make suitable environment to rearing duck more productive with the available local feed from wetland-based activities (shrimp and fish waste) make the duck rearing more productive, feasible and as an economical viable livelihood option for the household. This study will helpful to know about the total economic value generated by duck rearing activities happening in around the Vembanad lake.

## 2. METHODOLOGY

The economic value generated by rearing of duck by the household situated in around the Vembanad lake was estimated. A sample of 30 households taking up duck rearing in backyard farms were randomly selected for the study which was carried out during year [8]. Based on the total duck population in each district the sample units were distributed based on the probability proportional sampling procedure gives (EKM-7, ALPY-17 and KTYM-6). Data related to the district-wise total number ducks available in the three districts situated around the Vembanad lake were obtained from report on Integrated Sample Survey [8], Govt of Kerala. The primary data collected related to the estimation of the gross value of backyard duck rearing household units and included number of ducks reared, egg produced annually and selling price of duck egg

and meat in local markets. The formula for quantifying gross value of the duck reared by the sample household are given below.

$$GR_i = (\sum_{i=1}^n (TW_{iD} P_D) + (Q_{iE} P_E)) / N \dots \text{(eq.1)}$$

$$TW_{iD} = N_{iD} AW_{iD} \dots \dots \dots \text{(eq.2)}$$

For estimating the Total Value of the duck reared the following was used.

$$TV_{DV} = ((TN_{DV} AW_D) P_D) + (TN_{EV} P_E) \dots \text{(eq.3)}$$

Where,

$TV_{DV}$  = Total value of the duck reared in around the Vembanad lake (Rs Lakhs)

$TN_{DV}$  = Total number of ducks reared in around the Vembanad lake (No's)

$TN_{EV}$  = Total number of duck egg obtained in around the Vembanad lake (No's)

$GR_i$  = Average gross return of duck reared in sample household (Rs/annum)

$N_{iD}$  = Total number of ducks reared in  $i^{th}$  household unit per annum (No's/unit/year)

$AW_{iD}$  = Average weight of duck reared in  $i^{th}$  household unit (Kg/duck)

$AW_D$  = Average weight of duck reared in the total sample household (Kg/duck)

$TW_{iD}$  = Annual total weight of duck reared in  $i^{th}$  household unit (Kg/duck/year)

$Q_{iE}$  = Annual total number of duck eggs obtained (No's/year)

$P_D$  = Market price of duck (Rs/Kg)

$P_E$  = Market price of eggs (Rs/Piece)

$N$  = Total number of sample household units

$I$  = Individual duck rearing sample household unit

### 3. RESULTS AND DISCUSSION

The district wise duck population and egg production for both Desi and improved breed of

ducks for the three districts are presented in the Table 1. Alappuzha district has the largest number of desi and improved breed ducks 61% and 52% respectively of total duck population of Vembanad region. During the year 2018-19 there were a steep increase in the number of improved duck breed population in Alappuzha district by about 70% and a 10 percent decrease shown in the number of desi breed ducks. This was due to the demand for the duck egg and meat in the region.

Table 2 depicts that the average number of ducks reared by households situated along the Vembanad lake is estimated to about 239, out of which Alappuzha had greater of average number of ducks per sample household of about 302. The total duck population in Alappuzha district was about 1.89 lakhs. i.e., 26% of total duck population in Kerala and 56 percent along the Vembanad lake. This shows that Alappuzha district farmers are having more experience as well as the wetland area is highly suitable for duck production and rearing. The annual average gross revenue generated per household rearing duck is estimated to about INR 1.95 lakhs. The household situated in Alappuzha district got a gross income of about INR 2.45 lakhs per year. The average weight of the duck is about 1.2 kg and the total number of ducks gives the total quantity of duck in terms of body weight is about 406 tonnes. (Harikrishnan et al. 2012) studies showed that Kuttanad ducks at eight weeks of age and reported a carcass weight i.e. (cold body weight) of about 937g and dressing percentage of 60.57 to 67.6 per cent. There is a scope for increase duck meat weight, but the average weight of duck reared in the Vembanad lake as shown in the Table 2 is about 1.2 Kg, if there will be a taken proper care by increasing the feed rate then it has more chance of increase the duck body weight up to 2 Kg [9]. The total value of duck was estimated at INR 12.18 crore based on the market price prevailing during 2018-19. Similarly, for estimating the total value of egg produced in the study area. The annual average number of eggs laid per duck reared in all the sample households situated around the Vembanad lake was taken as a base which was estimated at 60 per household. The current level of egg production is obtained without giving any supplementary feed ingredients, if there is proper care and supplementary feed more scope for increase average egg production per duck per year more than double. i.e., up to 200 egg/year/duck [9]. Sapkota et al. [10] stated that optimum slaughter weights of duck were 1.5 Kg

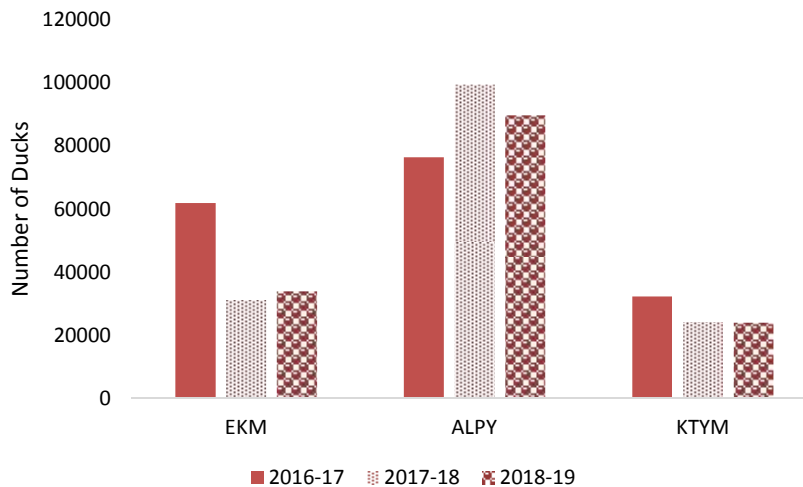
**Table 1. District-wise quantity of desi and improved breed ducks and egg production details during the year 2018-19 (Quantity in Nos)**

	Variety	EKM	ALPEY	KTYM	Total
Duck (No's)	Desi	34016	89811	24060	147887
	Improved	43062	99540	47926	190528
	Total	77078	189351	71986	338415
Egg (Lakhs)	Desi	54.99	149.94	35.14	240.07
	Improved	72.04	163.78	80.92	316.74
	Total	127.04	313.73	116.05	556.81

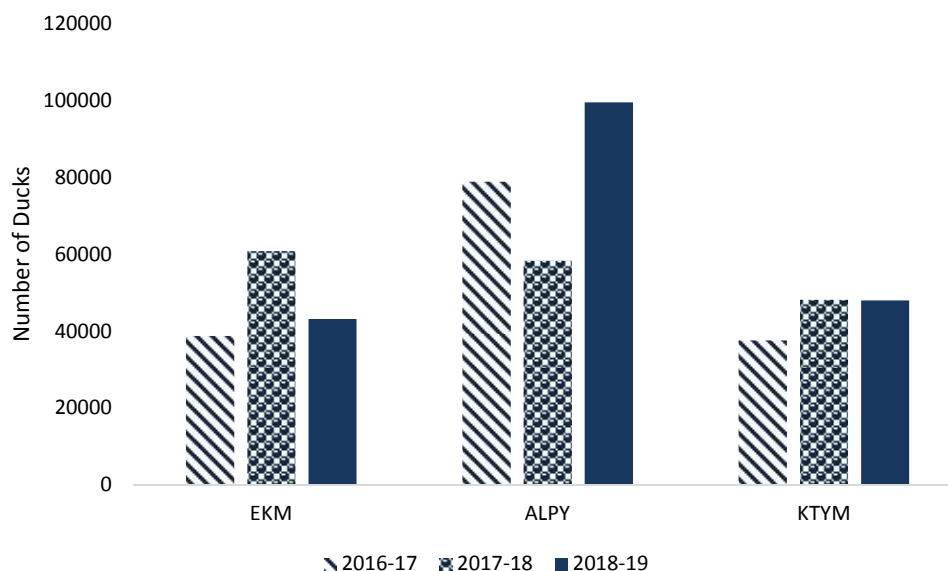
Source: SS 2018-19, GoK

and 1.4 Kg/duck. Using this estimate, the total number of eggs produced from the entire study area is estimated at about INR 203 lakhs and the value generated through sale of egg is about INR 1544 lakhs. The total value generated per annum thus INR 27.62 crores out of which almost 55.68 percent of the economic value is generated from

Alappuzha district, where Kuttanad region is also a part. Though market price of both duck and egg were slightly lesser compared to the other districts in Alappuzha. The average number of ducks per farm household was higher and every household maximized their profits through duck rearing activities.

**Fig. 1. Total number of desi breed ducks available in around Vembanad lake covering districts from year 2016-17 to 2018-19****Table 2. Gross economic value of duck reared by the household in around the Vembanad lake during the year 2018-19**

Particulars	EKM	ALPY	KTYM	Total
Number of duck rearing sample household (No's)	7.00	17.00	6.00	30.00
Average number of ducks reared per household (No's)	82	302	132	239
Average gross income obtained by duck rearing per sample households (Rs/Year)	66978	245224	104940	195024
Total number of duck (No's)	77078	189351	71986	338415
Average weight per duck (Kg/duck)	1.10	1.30	1.20	1.20
Total annual quantity of duck (Kg)	84786	246156	86383	406098
Average numbers of eggs laid/duck/year (No's)	56	64	58	60
Total number of eggs per year (No's in Lakhs)	43.16	121.18	41.75	203.05
Market price of a duck (Rs/Kg)	320	280	300	300
Market price of an egg (Rs/piece)	8.30	7.00	7.50	7.60
Total value of ducks (Rs in Lakhs/Year)	271.31	689.24	259.15	1218.29
Total value of eggs (Rs in Lakhs/ Year)	358.26	848.29	313.14	1543.17
Economic value of duck (Rs in Lakhs/ Year)	629.57	1537.53	572.29	2761.47



**Fig. 2. Total number of improved breed ducks available in around Vembanad lake covering districts from year 2016-17 to 2018-19**

#### 4. CONCLUSION

In this study of estimation of economic value of duck rearing in the backyard of household. It is understood that Vembanad lake plays a significant role in providing various provisional services to their beneficiaries in which duck rearing is also a major revenue generating activity with the total economic value of about INR 27.62 crores. This value leads more importance to duck farming as an equal to various major activities such as fishing, agriculture and clam fishing activities. Duck rearing is also considered as a major livelihood option for the households situated in the banks of the Vembanad lake.

#### CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the authors.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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