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Analysis of profitability dynamics in commercial canine breeding through multiple linear regression#

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Abstract

Canine breeding as a profession has the potential to create employment opportunities in Kerala. Establishing and managing a canine breeding enterprise can generate jobs in fields related to animal welfare, health, and administration. Nevertheless, the state faces a dearth of dependable data regarding the factors affecting the economic viability of commercial canine breeding enterprise. The current study was undertaken to assess the influence of selected demographic factors and economic parameters on economic viability of commercial canine breeding units so as to assist the potential investors in decision making. The research was carried out on 60 randomly selected commercial canine breeding enterprise from the

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Ernakulam and Thrissur districts during 2021-2022 period. The research design used was ex-post facto research design. Multiple linear regression and Karl Pearson correlation method was used for the statistical analysis of the data, utilising the SPSS version 26. The study unveiled that

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the profitability of commercial canine breeding enterprise was influenced by the breeding stock size, experience (in years), puppies born in a kennel, level of adoption of scientific management practices and veterinary and labour expenditure.

Canine breeding has recently attracted significant attention among individuals. This venture has good potential for income generation, marking a notable departure from its traditional perception as a less lucrative venture with limited profitability and job creation potential. According to 20th livestock census canine population in India is estimated to be around 9.4 million with Kerala accounting for seven lakhs. Hence it is imperative to study on the economics of canine breeding and analyse the aspects that could affect its profitability. In contrast to livestock farming sector, the production process in canine breeding is complex to classify into uniform age, weight, and breed categories. In addition to the production of puppies and providing stud services, the main objective of commercial canine breeding was not oriented towards the provision of meat or other tangible products. Therefore, assessing the canine breeding enterprise and understanding the essential factors for its success is vital to offer valuable guidance to individuals interested in venturing into this field. It is advisable to have a thorough understanding of the factors affecting profitability in running animal-based production units as commercial canine breeding forms a livelihood activity involving pet animals. Based on the aforementioned facts, the present study was undertaken with the objective of studying the economics of canine breeding and factors affecting profitability of this venture.

Materials and methods

To investigate the determinants of profitability commercial canine breeding units in Kerala, two districts, Thrissur and Ernakulam, were purposefully selected due to their distinction of having the highest number of purebred canine litters registered with the Kennel Club of India. A sample of 60 commercial canine breeders were selected randomly, from a sampling frame prepared by the Key Informant Technique (Tremblay, 1957). The key informants included members of Kennel Club of India, veterinarians, and commercial canine breeders. Separate sampling frames were constructed for each of these two districts. Simple random sampling was used to select 30 respondents from Ernakulam and 30 respondents Thrissur District, that constitute a sample size to 60. Data collection was done using a well-structured pretested interview schedule through direct non participant observation to ensure the reliability of data. Overall, this schedule consisted of 22 closed ended questions. The data were analysed using appropriate statistical methods.

Results and discussion

The factors affecting profitability of the commercial canine breeding units were experience of commercial canine breeder, breeding stock size (number of adult animals reared), puppies born in a kennel, veterinary and labour expenses, and level of adoption of scientific management practices (Table 1). These factors were accessed in detail with supporting and defending research findings across the globe.

To predict the profitability of commercial canine breeding units, five independent variables, *viz*., experience of commercial canine breeders in years, puppies born in a kennel, veterinary expenses, feed cost and level of adoption (Table 2) were fitted into the regression model. According to Table 2, the adjusted coefficient of determination (adjusted R^2) was .785 which indicated that the independent variables selected could explain 78.5 per cent of the variation observed in the profitability of commercial canine breeding units leaving only 21.5 per cent unexplained. Standard error of the estimate was 75168.55.

The multiple linear regression equation fitted to the data was

$$y = \beta0 + \beta1 \times x1 + \beta2 \times x2 + \beta3 \times x3 + \beta4 \times x4 + \beta5 \times x5$$

were, Profitability of commercial canine breeding units (y), Experience (in years) x1, puppies born in a kennel (x2), veterinary expenses (x3), Feed cost (x4), Level of adoption (x5)

Table 1. Relationship between independent variables and the profitability of commercial canine breeding(n=60)

Sl. No.	Independent variable	Pearson's correlation coefficient (r)	p value
1.	Age of commercial canine breeder	.017^{ns}	.896
2.	Years of experience in canine breeding	.880**	.000
3.	Number of adult animals reared	.465**	.000
4.	Number of breeds reared	-.027^{ns}	.835
5.	Puppies born in a kennel	.539**	.000
6.	Veterinary expense	.324*	.011
7.	Feed cost	.124^{ns}	.344
8.	Total fixed cost	.168^{ns}	.198
9.	Labour cost	.388**	.002
10.	Level of adoption	.245*	.030
11.	Level of knowledge	.209^{ns}	.109

** Significant at 5 per cent level*
*** Significant at 1 per cent level*
ns - not significant

Regression equation and predictor relationship

The multiple linear regression equation established was

$y = -88449.598 + 28504.222 \times x1 + 3131.421 \times x2 + (-.285 \times x3) + (-1504.667 \times x4) +$

$(-1504.667 \times x5)$. Where Constant (y) is -88449.598, β 1 = 28504.222, β 2 = 3131.421, β 3 = -.775, β 4 = -.285, β 5 = -1504.667.

Assuming breeder's experience (in years) in canine breeding, puppies born in a kennel, feed and veterinary expenses and adoption level were all zero, then the profitability of the canine breeding units would be INR -88449.59/-. A one-year increase in experience in canine breeding (x1) resulted in INR 28504.222 increase in profitability. A one-unit increase in the puppies born in a kennel (x2) would result in a profit rise of INR 3131.421. Profit was reduced by INR 0.775 due to a shift in veterinary expenses per unit. A one-unit increase in feed cost resulted in -.285-unit drop in profit. Changing the level of

Table 2. Multiple linear regression analysis showing influence of selected demographic factors and economic parameters on profitability of commercial canine breeding units

Sl. No.	Independent Variables	Unstandardised Coefficient beta		Standardised coefficients	t values	Level of significance p values	Mean ± Standard Deviation
		B	Standard error	Beta			
	Constant	-88449.598	137527.769		-.643	.523	
1	Years of experience	28504.222	2931.345	.773	9.724	.000	11 ± 4.4
2	Puppies born in a kennel	3131.421	1235.600	.310	2.534	.014	27.35 ± 16.06
3	Veterinary expenses	-.775	1.975	-.031	-.392	.696	12339.17 ± 6527.54
4	Feed cost	-.285	.132	-.206	-2.157	.036	143991.33 ± 117408.94
5	Level of adoption	-1504.667	2955.850	-.034	-.509	.613	46.83 ± 3.020
Dependent variable Profit of commercial canine breeding units							196743.2 ± 162300.51
R square = .804 Adjusted R square = .785							

adoption by one unit would result in a profit loss of INR1504.667.

The study revealed that majority (51.66 per cent) of the canine breeders had more than 15 years of experience in breeding. Furthermore, the study indicated an association between the experience of breeder and profitability of commercial canine breeding enterprise. Respondents with more than 15 years of breeding experience predominantly owned the high and medium level lucrative businesses. Years of expertise was the most important component affecting the profitability of the canine breeding enterprise. An increased profit of Rs. 28504.22 was observed for a unit increase in the experience (in years) of the breeder. Prior experience in canine breeding activities is thus an important variable that should be considered by aspiring breeders. This expertise can be achieved by setting up trainings and workshops by veterinary universities, kennel clubs and vocational schools thereby those who are interested in canine breeding can get hands-on experience managing kennel activities. Before managing their own kennels, potential breeders can work as apprentices in kennels. Ishola (2016) Ombasa (2017) and Schutjens and Wever (2000) also reported similar findings in their study. Torres *et al*. (2019) conducted a study on kennel management practices in Costa Rica, where they found that breeders employed unique management techniques. These techniques were derived from the breeder's experience and the technical support procedures provided by individuals overseeing the process. The above findings are in consensus with those of the current study.

The profitability of the commercial canine breeding units and puppies born in a kennel had a strong association. The main source of income in a canine breeding enterprise is from the puppy sales hence to increasing the number of puppies born in a kennel and minimising the mortality rate could increase the profitability. Increasing the annual puppy yield by increasing litter size through better selection and rearing of more breeding stocks is an important strategy in this regard. Murat *et al*. (2018) also made similar findings, and opined that raising the annual puppy yield and minimising the production cost would enhance the profitability of commercial kennels. According to Lima *et al*. (2020), litter size of goat and prolificacy rate have been recognised as important factors that could increase the profitability of goat farms. Ishola (2016), however, found no significant correlation between kennel population and the economic viability of dog breeding enterprises of Nigeria. This contradictory finding may be attributed to the influence of preferences of customers of Nigeria and seasonal fluctuations that cause variations in the pricing of puppies. Rearing the most demanded breed with good lineage and breed characteristics can bring good returns when compared rearing a greater number of animals at a time.

The study findings also shed light on the fact that profitability of commercial canine breeding enterprise was significantly influences by veterinary expenses. Among veterinary domestic species, canine pregnancies are distinct because of the longer whelping period and the significant influence of environmental factors on the neonates (Kuttan *et al.*, 2017). Providing improved health care facilities, and diagnostic technologies can increase the animal health and productivity. Detection of heat in bitch is critical in canine breeding profitability. A breeder would lose considerable amount of money if he missed an oestrus cycle. Many breeding endeavours have improved their efficiency using scientific methods like hormone assays, exfoliative vaginal cytology to predict breeding time, and ultrasound techniques to confirm pregnancy. Ishola (2016) supported this finding by his finding that bitch becoming pregnant in every mating was found to be a factor affecting the profitability of canine breeding industry. Early identification and treatment of infectious diseases can prevent the spread of illness in kennels and thereby reduce financial loss and health related issues. In the case of rabies, where the consequences can be fatal and the disease has a global impact, the commitment to early identification, treatment, and veterinary care serves as a vital component in preventing the spread of this infectious disease and ensuring the overall well-being of both animals and humans (Vijaykumar and Jose, 2021). This proactive approach might have led the breeders spend

good amount of money towards veterinary expenses. The present study revealed that, for every rupee spent on veterinary care there was a loss of 0.775 rupees. Hence better preventive care for the breeding dogs would be reflected in the profitability.

Profitability was strongly associated with labour costs. As the total dogs housed increases, labour costs rise as well, which has an impact on profitability. Close monitoring of the animals during peripartum period was a vital factor in stress management since this period is the most stressful period. Human interventions to minimise stress was identified as a preventive measure and a curative action. Positive human interactions and bonding will improve the welfare of animals by minimising their anxiety level as dogs are very attached to humans (Rault *et al*. 2020). The breeder and their family members carried out most of the labour activities of the kennel. We have considered the sentimental labour in to actual labour hours. Hence as more work is being carried out in the kennel profitability also increases. Similar results were reported by Saitone *et al.* (2020) who found that as the number of dogs kept in a kennel increased labour cost also increases. However, George *et al*. (2022) reported that there is an excessive use of labour in small dairy farms, reducing the amount of labour input could enhance efficient resource utilisation without adversely affecting the production. Arnott *et al*. (2014) reported that minimising variable cost, operational cost and labour cost will maximise the profitability.

Feed cost was identified as a significant factor affecting profitability of commercial canine breeding venture. A profit loss of 0.285 rupees is recorded for a unit change in feed cost. Despite the availability and convenience of commercially prepared dog foods, majority (61.66 per cent) of the breeders preferred to provide home-made diets, the majority of which do not follow a standard recipe. Barac and Muminovic (2018) found that none of the variable expenditure management strategies could significantly affect profitability.

Level of adoption on scientific dog management practices was found to be significantly associated with profitability of commercial canine breeding units. There was a profit loss of -1504.667 rupees for a unit change in adoption level. Therefore, it was found that there was a significant association between profitability and the level of adoption of scientific dog management practices. It is also worth noting that increasing the use of scientific dog management practices will increase dog welfare and, as a result, the quality of puppies produced. Kennels that follow scientific management procedures could be recognized and labelled as elite by authorities, and such kennels could get a higher price for their puppies.

Kerala state has the highest literacy rate of 93.91 per cent (Census of India 2011), This educational attainment has cultivated a culture that values critical thinking, innovation, and the application of scientific principles. Majority (43.33 per cent) of the commercial dog breeders of Thrissur and Ernakulam districts were graduate (Ravindranath *et al*., 2019). Moreover, a report published by the Kerala State Planning Board titled 'Economic Review 2022' highlights the state's advancement in various sectors, attributing much of its success to the educated workforce and their adeptness in adopting modern practices, including those grounded in science and technology. The report underscores the correlation between education and economic development, indicating that Kerala's investment in education has fostered a business environment conducive to scientific advancements. Since all the commercial canine breeding endeavors were profitable, the profit-oriented techniques or practices could be adopted more widely. Higher levels of education among entrepreneurs correlate with the adoption of innovative and scientifically informed approaches in business management, leading to greater efficiency and competitiveness (Kannan, 2022). Similar findings were reported by Foltz and Chang (2002) that farmers with higher level of education tend to adopt newer productive technologies in their farms. Profitability and adoption were significantly correlated in livestock farms in a study by Finlayson *et al.* (2012). Ombasa (2017) opined that government should take appropriate measures to pass the knowledge of dog breeding to dog breeders for adoption.

Conclusion

Regarding factors affecting profitability, experience (in years) in canine breeding, stock size of kennel, puppies born in a kennel and labour expenses were correlated to profitability with one per cent level of significance. Veterinary cost and adoption level of scientific management practices I were also correlated with the commercial canine breeding profitability with five per cent level of significance. Commercial canine breeding is a lucrative business that unemployed and partially employed people in Kerala can pursue as an entrepreneurial enterprise. The government should take suitable steps to pass on breeding knowledge to canine breeders for adoption.

There is a positive correlation between the profitability of commercial canine breeding endeavours and the extent of adoption of scientific practices. To enhance their proficiency in scientific methodologies pertaining to canine breeding and management, breeders should actively pursue training, workshops, and participation in relevant events to augment their expertise and competence. Moreover, there exists a positive correlation between the profitability of commercial canine breeding ventures and the level of experience. Individuals aspiring to enter the breeding industry can enhance their expertise by apprenticing in established breeding facilities, thereby gaining practical insights before initiating independent ventures. Commercial canine breeders should look for financial assistance from the government and other formal lenders. If they are duly registered with the Animal Welfare Board of India (AWBI) and local self-government, aspiring individuals may enhance their chances of securing credit from formal credit institutions and conducting business more efficiently. The findings emphasise the necessity of additional studies in this area to provide entrepreneurs with the tools they need to run profitable businesses.

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Conflict of interest

The authors declare that they have no conflict of interest.

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