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Research Paper

Optimizing the Herd Size in Urban Dairy Farming in Tamil Nadu – A Quadratic Function Approach

Veterinary Science

KEYWORDS : Optimum Farm Size – Profit Maximization - Quadratic Production Function.

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ABSTRACT

The Study was under taken to find out the optimum farm size in urban dairy farming in Tamil Nadu. A total sample size of 180 dairy cow farmers was selected from three urban milk shed areas of Tamil Nadu namely Chennai (Tambaram), Erode and Vellore for the present study. The farms were classified into small, medium and large based on the number of cows. To find out the optimum number of dairy cows to be maintained in the different farm size category, Quadratic function was used in which net profit per farm was taken as dependent variable and the farm size was taken as independent variable. The results of Quadratic function revealed that the optimum size was found to be 2.97, 4.76 and 10.6 respectively in small, medium and large farms and the average size of dairy farms were 1.66, 3.91 and 7.91 respectively in these categories of farms. This revealed that the average size of the dairy farms was far below the optimal size. Hence the maximum possible profit was not realized from these farms. From the results, it could be inferred that the small, medium and large categories of dairy farms should maintain at least 3, 5 and 10 cows respectively to reap up the maximum possible potential profit in the study area.

INTRODUCTION

During the last three decades, our Nation's milk producers have transformed Indian dairying from stagnation to world leadership. In India, dairying is recognized as an instrument for social and economic development. The Nation's milk supply comes from millions of small producers. India ranks first in the world in milk production (127.9 million tonnes). The per capita availability of milk is 290 grams in 2012-2013. Milk emerged as one of the biggest contributor to the value of agricultural output in the country. Increase in milk production with limited resources like quality and quantity of feed, labour, genetic potential of the animal and to ensure the optimal use of various inputs used by the milk producers is matter of primary concern. It is important to know whether the inputs owned by milk producers are used efficiently or not. However, dairy farmers in urban areas are still faced with key decisions on how best to produce milk and what will be the optimum farm size to achieve maximum profit with their given limited resources. Thus, the main objective of this study is to conduct non linear production function analyses of dairy farms in the urban areas of Tamil Nadu. Similar study was carried out by Normand and William (2012). The results derived from the analyses may assist agricultural economic advisors and dairy extension agents to advise farmers on how to optimize the farm size so as to receive maximum profit with the scarce factors of production. The results may also provide dairy farmers and policy-makers with a better insight into the optimum number of animals to be allocated in a farm for profit maximization in urban areas of Tamil Nadu.

MATERIALS AND METHODS

In Tamil Nadu, three urban milk shed areas namely Chennai (Tambaram), Erode and Vellore were selected for the present study. From each of these areas, 60 dairy farmers were selected by Simple random sampling technique. In all, a total sample size of 180 dairy farmers was selected for the present study.

Period of study:

The field survey for this study was conducted during the month of November and December 2013 and the data was collected from the sample units related to the year 2013.

Collection of data:

Information relating to various aspects of dairy farming was collected from selected farmers by survey method with a well-designed and pre-tested interview schedule. Details of inputs used like green fodder, dry fodder, concentrates with their quantities and price, labour employed with wage particulars veterinary and breeding expenses, miscellaneous expenses and data on outputs like milk, manure and gunny bag were also collected from the dairy farmers. The data collected are analyzed with a view to achieve the objectives of the study as follows:

Analytical Framework:

The non linear production function was used to estimate the optimum size of the farm, so as to receive maximum profit (Bose, 1992). The quadratic production functional analysis was used which relates the profit per farm as dependent variable and the farm size as independent variable. Similar study was conducted in broiler farming (Jebarani and Pandian, 2006). Net profit per farm was worked out by subtracting the total cost (sum of the fixed cost and variable cost of the farm) from the total return.

The simple quadratic function was defined as follows:

$Y = a + b_1X + b_2X^2$

Y = Net profit per farm (Rs.)

X = Farm size (number of animals)

Differentiating the above equation would yield the profit maximizing level of herd size i.e. by equating $dy_p/dx = 0$.

RESULTS AND DISCUSSION

The observations from the study revealed that there was a skewed distribution of the farms with the dominance of small farms was the characteristics of the urban dairy farming i.e. among the total 180 sample dairy farms, 112 were small farms (62.2 per cent), 46 were medium farms (25.5 per cent) and 22 were large farms (12.2 per cent). This might be due to the availability of space, funds, market potential and the preference of the farmers could also contribute to the determination of farm size. The average net profit per farm per day was found to be around INR.126 (range from INR.32 to INR.400). In the total cost, variable cost accounted for more than 90 per cent in all the farms. This was in accordance with the findings of Rajendran (1986) and Ganesan (1986).

Optimum size of the urban dairy farm:

A quadratic function was fitted which relates the net profit per farm and the farm size for the three categories of farms. The results are given in table 1.

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Table: 1 Optimum herd size in urban dairy farms

Farm size	Quadratic equation	Adjusted R^2	Optimum size	Average size
Small farms	y_p = -42.52+100.43x-16.87x^2	0.890**	2.97	1.66
Medium farms	y_p = -251.64+188.99x-19.83x^2	0.893**	4.76	3.91
Large farms	y_p = -396.92+148.907x-6.967x^2	0.985**	10.6	7.91

The table no.1 provides the details of Quadratic function fitted, the average and the optimum herd size. The results in the table revealed that the optimum size of the dairy farm should be 2.97, 4.76 and 10.6 in small, medium and large farms respectively but the average sizes of dairy farms were 1.66, 3.91 and 7.91 in these categories of farms which indicates that the average size of the dairy farms was far below the optimal size. This revealed that the resources are not used efficiently in the dairy cow farms and augmented the cost of production which in turn leads to decline in profit level i.e. the maximum possible profit was not realized from these farms. Hence, it could be inferred that the small, medium and large categories of dairy farms should maintain at least 3, 5 and 10 cows respectively to reduce the cost of production by using the limited resources efficiently and to reap up the maximum possible potential profit from urban milk production in the study area.

SUMMARY AND CONCLUSIONS

The study of optimization of farm size in urban dairy farms of Tamil Nadu revealed that the average size of dairy farms were 1.66, 3.91 and 7.91 respectively in small, medium and large farms and the optimum size was found to be 2.97, 4.76 and 10.6 respectively in these categories of farms. From the results, it could be inferred that the small, medium and large categories of dairy farms should maintain at least 3, 5 and 10 animals respectively to reap up the maximum possible potential profit from urban milk production in the study area.

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