RESOURCE PRODUCTIVITY IN MILK PRODUCTION

BY

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ABSTRACT
A milk production function was estimated from the primary data collected from the dairy producers. The objective of the study was to check different input relationship in getting maximum output. Results obtained provide evidence that the profit of the dairymen can be increased through the efficient use of various resources.

KEYWORDS: Milk, dairy, livestock, input relationship, commodity, Pakistan

INTRODUCTION
Livestock sector contributes almost 50 percent to the value addition in agriculture sector and almost 11 percent to Pakistan’s GDP, which is higher than the contribution made by crop sector (47.4 % in agriculture and 10.3 % in GDP). Within the livestock sector, milk is the largest and single most important commodity. Despite decades of neglect, Pakistan is the fifth largest milk producer in the world. The total production of the milk in the country has been doubled in the last 15 years. Buffalo and cattle are the major source of milk as their contribution in total milk production falls around 67 and 32 percent respectively (Pakistan economic Survey 2006-07). The total value of the milk produced is higher than the value of two major crops, which are wheat and cotton.

Over the period 1991-92 to 2006-06, the total milk production in Pakistan increased from 15.98 to 31.30 million tones with 95 % annual growth rate. Over the same period, human population increased from 112.6 million (1991) to 153.96 million in 2005. Consequently, the average per capita availability of milk was 155.8 liters per year. However, per capita consumption of fresh milk was 6.67 liters per month (Government of Pakistan 2005-06).

The bulk of milk production in our country is in the hands of millions of small producers scattered all over the country. To most of them it is supplementary or complementary enterprise only. Therefore, there exists a vast scope for improving the milk production by commercializing this enterprise. Milk production can be increased either by increasing the number of milch animals or by rear substantially additional number of animals as there is already a heavy pressure of animals per unit of land (Niazi 2004). Moreover, pressure of cash and food crops on land is increasing day by day leaving less land for growing fodder crops.

Increase in productivity of animals may come from two directions, namely, feeding and management and breeding. Compared to the former, breeding and selection are relatively slow processes. In the short run, feeding and management are the major factors influencing milk production (Kirkland and Gordon 2001). The dairy men who rear the milch animals have little specific knowledge about the feeding requirements since they are usually illiterate. They mostly depend on the practices and myths left by their ancestors.
They feed large amount of dry roughages with little green fodder and a few Kg of unbalanced concentrate mixture to the milch animals. The well to do people overfeed their animals due to lack of interest and knowledge. A few studies have been conducted in Pakistan pertaining to various aspects of milk production but no one of these aimed at determining the optimum level of various inputs which maximize the profit of the producers. The present study was therefore conducted with the following objectives:

1. To establish input-output relationship in milk production.
2. To determine the optimum quantities of various inputs and milk output.

**METHODOLOGY**

As a matter of fact this study should have been conducted in rural areas. But, in these areas, animals are fed in lots and the exact quantity of feed consumed per animal cannot be ascertained. To see this point, we took the sample size from urban and semi urban areas of central poonch. Since most of producers in the urban areas buy different concentrates from market, therefore it is easy to get accurate results about the quantity of various feeds fed per day. The study was confined to roadside areas of Rawalakot including the urban area of town as well as the surrounding areas. The study involved only the buffaloes as the people of the target area like the buffaloe milk and majority of farmers rear this animal. Before the data collection, a comprehensive interview schedule was designed. After pretesting, the interview schedule was used for data collection. Data were collected for the last fifteen days of April 2006 from the milk producers for 75 buffaloes.

Various functional forms of production function were tried to express the relationship between milk output per milch animal and the various input factors influencing it. Of these, quadratic production function was chosen on the basis of signs of coefficients, level of significance of the included variables and for its highest $R^2$ (Coefficient of multiple determination). Quadratic production function used in this study is as under.

$$Y = a + b_1 WN + b_2 WN + b_3 CC + b_4 MS + b_5 WB + b_6 SL + b_7 L + b_8 WN^2 + b_9 CC^2 + b_{10} MS^2 + b_{11} WB^2 + b_{12} GF^2 + b_{13} SL^2 + b_{14} CCLN + b_{15} MSGF + b_{16} LNSL + b_{17} WBCC$$

Where:

- $Y$ = Average daily milk yield per milch buffalo in kilograms over the previous week.
- $WN$ = Kilograms of wheat bran fed per milch animal per day in the previous week.
- $CC$ = Kilogram of cottonseed cake fed per milch animal per day in the previous week.
- $MS$ = Kilogram of maize straw fed per milch animal per day in the previous week.
- $WB$ = Kilogram of wheat bhoosa fed per milch animal per day in the previous week.
- $GF$ = Kilograms of green fodder fed per milch animal per day in the previous week.
- $L$ = Labour hours used per animal per day.
- $SL$ = the stage of lactation, i.e. period since calving in months.
- $LN$ = The number of lactation.

**RESULTS AND DISCUSSION**

The estimated equation expressing milk yield as a function of wheat bran, cottonseed cake, maize straw, wheat bhoosa, green fodder, labour and other variables such as lactation number and advancement of lactation is given in table 1.

An examination of the coefficients of multiple determination of the production equation revealed the value of $R^2$ to be 0.98 percent of the total variation in milk yield. Both the linear and quadratic terms for different variables had the signs which were expected according to economic theory.

**Maximization of milk yield through resource adjustment**

To determine the extent of increase in the milk yield through the optimal allocation of inputs, the optimum quantity of various inputs was determined. The optimally allocated level of various inputs along with their existing levels is presented in table 2. It may be noted that the level of wheat bran and cotton seed cake increased from 1.69 kg and 1.68 kg in the existing plan to 2.90 and 2.76 kg respectively at the optimal level, while that of wheat bhoosa and maize straw decreased from 5.36 and 6.50 kg in the existing plan to 4.36 kg and 4.69 kg respectively at the optimum level.
Table-1: Estimated production function for different variables

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Regression Coefficients</th>
<th>Standard Errors</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-4.543</td>
<td>3.221**</td>
<td>2.50</td>
</tr>
<tr>
<td>Wheat bran (WN)</td>
<td>2.510 **</td>
<td>0.065</td>
<td>2.89</td>
</tr>
<tr>
<td>Cotton Seed Cake (CC)</td>
<td>0.091b</td>
<td>0.066</td>
<td>2.51</td>
</tr>
<tr>
<td>Maize Straw (MS)</td>
<td>0.238**</td>
<td>0.063</td>
<td>3.64</td>
</tr>
<tr>
<td>Wheat Bhoosa (WB)</td>
<td>0.224**</td>
<td>0.270</td>
<td>3.14</td>
</tr>
<tr>
<td>Green Fodder (GF)</td>
<td>-0.362</td>
<td>0.423</td>
<td>0.85</td>
</tr>
<tr>
<td>Stage of Lactation (SL)</td>
<td>-0.0362</td>
<td>0.181</td>
<td>2.74</td>
</tr>
<tr>
<td>Labour (L)</td>
<td>-0.501**</td>
<td>0.212</td>
<td>2.46</td>
</tr>
<tr>
<td></td>
<td>(WN^2)</td>
<td>0.005*</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>(CC2)</td>
<td>0.007</td>
<td>3.66</td>
</tr>
<tr>
<td></td>
<td>(MF2)</td>
<td>0.022</td>
<td>1.99</td>
</tr>
<tr>
<td></td>
<td>(WB^2)</td>
<td>0.0007</td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td>(GF2)</td>
<td>0.0006</td>
<td>3.66</td>
</tr>
<tr>
<td></td>
<td>(SL2)</td>
<td>0.001</td>
<td>3.66</td>
</tr>
<tr>
<td></td>
<td>(CCLN)</td>
<td>0.001</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>(MFGF)</td>
<td>0.0006</td>
<td>1.99</td>
</tr>
<tr>
<td></td>
<td>(LNSL)</td>
<td>0.0007</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>(WBCC)</td>
<td>0.0006</td>
<td>3.66</td>
</tr>
</tbody>
</table>

R^2 = 97.97 percent. F Ratio = 260.25

a = Significant at 10 percent level of significance.
b = Significant at 20 percent level of significance.
* = Significant at 5 percent level of significance.
** = Significant at 10 percent level of significance.

Table-2: Optimized and existing levels of feeds and fodder inputs (Kg)

<table>
<thead>
<tr>
<th>Level</th>
<th>Wheat Bran</th>
<th>Cotton Seed Cake</th>
<th>Maize Fodder</th>
<th>Wheat Bhoosa</th>
<th>Green Fodder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing</td>
<td>1.69</td>
<td>1.68</td>
<td>6.50</td>
<td>5.36</td>
<td>19.42</td>
</tr>
<tr>
<td>Optimal</td>
<td>2.90</td>
<td>2.96</td>
<td>4.69</td>
<td>4.36</td>
<td>19.42*</td>
</tr>
</tbody>
</table>

* The green fodder was non significant and has been kept at its existing level.

This revealed a shift of inputs from roughages to concentrates. These results confirmed the general observation that the dairy farmers are using large amounts of roughages and small quantities of various concentrates. The optimum level of milk output was determined by substituting the optimally allocated quantities of various inputs into the estimated equation. The optimum milk output per day came to 6.50 kg compared with 4.50 kg, under the existing quantities of various inputs. The increase in milk through adjustment of feeds and fodder inputs was 69 percent. Thus, a shift from existing level of feeding to an optimal one would involve an additional expenditure of Rs. 26 per day per milch animal, while the additional income from additional milk per animal would be more than Rs 50. This would further increase the profit of the dairy producer.

Policy Guidelines
1). The results of the study revealed that there existed great potential for increasing milk production through intensive use of concentrates, as the milch animals are fed at much lower level than the optimum. A number of reasons may be attributed to the low use levels of concentrates. The major concentrates, of course, include poor financial position of the dairy men and lack of knowledge/incentive or the high prices of the feeds. To correct the situation the following points deserve special attention.

a. Provision of production credit on easy terms to the milk producers for the purchase of concentrates.
b. Short duration practical training courses should be instituted for the dairy farmers in animal feeding and management.
2). Conventionally, cottonseed cake, wheat bran, rapeseed cake etc. have been used as dairy concentrates. Little efforts were made to introduce new commercial feeds by providing necessary incentives to the feed manufacturing sector and the consuming farming sector. Since there are no big pasture lands in the country, only the development of some efficient concentrated feeds can solve the problem.

3). Milk production among other factors, depends on the health of animals. More emphasis must be put to provide better health cover to dairy animals.

REFERENCES


