India has the largest cattle population in the world but the per capita availability of milk for human consumption is very low. The present milk production of about 24 million tons per year provides approximately 100 gm of milk per person per day, as against the requirement of 250 gm recommended by the National Commission on Agriculture. Sundaresan (1975) estimated that at the rate of 250 gm of milk per person per day, India should produce 60 million tons of milk per year by 1980 for a projected population of 700 million people.

The low level of milk production of Indian cattle can be attributed mainly to indiscriminate breeding and inadequate feeding. As selective breeding among the existing cattle is known to be a slow process of genetic improvement, crossbreeding of Indian cattle with European breeds has been taken up in many areas as the national policy for rapid increase in milk production. Various exotic breeds like Friesian, Jersey, Brown Swiss and Red Dane are being used for this purpose.
In a vast country like India, there is a need to assess the comparative performance of different exotic breeds used in crossbreeding with Zebu cattle, at various levels of exotic inheritance under divergent agroclimatic environments. Such an assessment will be of great use in formulating long term breeding plans.

The improvement obtained in the crossbreds can possibly be stabilized by resorting to inter se mating and selection. According to Mahadevan (1966), rigid selection which is important for genetic improvement within a breed is equally important in crossbreeding. Such a selection, if made early, will lead to faster genetic progress. Hence criteria for early selection are needed. These early selection criteria should be such that they are easily obtained and are also well related to the future performance of the animal.

It is always desirable to consider the performance of a dairy animal in terms of overall economic efficiency. However, economic productivity is influenced by location and time trends in relative prices of inputs and outputs. As feed cost forms between one-half and two-thirds of the total cost of milk production, it may be useful to consider feed conversion efficiency as a major factor determining the profitability of a dairy animal. Efficiency of milk production essentially refers to the ratio of milk output to feed input.

Whyte and Mathur (1965) estimated the feed and
fodder resources for Indian bovine population as follows:

<table>
<thead>
<tr>
<th></th>
<th>Concentrates</th>
<th>Green fodder</th>
<th>Dry fodder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirement</td>
<td>95.40</td>
<td>611.99</td>
<td>869.79</td>
</tr>
<tr>
<td>(million tons)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability</td>
<td>9.85</td>
<td>141.55</td>
<td>141.81</td>
</tr>
<tr>
<td>(million tons)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per cent deficit</td>
<td>89.88</td>
<td>76.87</td>
<td>83.69</td>
</tr>
</tbody>
</table>

These point to the need for utilizing the available feed resources more effectively by looking for those animals which can convert feed into milk more efficiently.

According to Robertson (1973), geneticists have for too long been naive in calling an animal superior merely because of its high output without paying any attention to inputs. Lindström (1976) visualized the following to be the likely trends in utilizing animal gene resources within the next 30 to 60 years:

1. Feed efficiency would be of increasing importance in all species.
2. Fertility traits would receive greater attention.
3. Overall economic merit would be given considerable emphasis while evaluating breeds or individuals within a breed.

Thus there appears to be a need to place greater emphasis on efficiency of milk production than on milk production alone. A knowledge of the environmental factors affecting the efficiency
of milk production and the genetic parameters for efficiency of milk production would hence be necessary as very little information is available on these aspects.

Since individual feed records of dairy cows are not generally maintained, it would be necessary to devise suitable methods for estimating efficiency of milk production. Body weight and milk yield provide indirect means for different criteria of efficiency of milk production since dairy cows are fed maintenance ration as per body weight and production ration according to milk yield. Thus there is a need to study various measures of efficiency of milk production based on the body weight and metabolic body size. The present study was taken up with the following objectives:

1. To study the differences in various characters like birth weight, body weights at different ages, age at first calving, weight at first calving, first lactation yield, lifetime production and efficiency of milk production among crossbred cattle involving different exotic breeds at various levels of exotic inheritance in the agroclimatic region comprising the states of Punjab, Haryana, Uttar Pradesh in the Indo-Gangetic plains.

2. To study the interrelationships among birth weight, body weights at different ages, age at first calving, weight at first calving, first lactation
yield, lifetime production and efficiency of milk production of crossbred cattle.

3. To study the genetic parameters for efficiency of milk production in crossbred cattle.