INTRODUCTION

Dairy cattle in India and elsewhere were among the earliest animals to have, throughout recorded history, remained useful for the health-status and well-being of human beings, as well as, associated with their advanced civilization. Indian cattle (*Bos indicus*) from ages have not only been a symbol of wealth but also an important source of milk, power and such other economic benefits. Indian economy revolves essentially around agriculture which is pivoted on cattle wealth. Just over 44 percent of India's total National income is contributed every year by agriculture along with dairying and animal husbandry (Statistical Abstracts of India, 1971). Milk produced by dairy cattle is a very important human food for all ages. This dietary product contains all the necessary nutrients such as fat, proteins (containing amino acids particularly methionine, leucine and tryptophane not found in plants), lactose, minerals—notably calcium and phosphorous, vitamins, enzymes and minor organic compounds.
Recognising its dietary importance as a component of mixed diet over several years, milk has been regarded as one of the sheet anchors of proper human nutrition in India, where the majority of population is of vegetarians.

Efficiency of production in dairy cattle is an often mentioned objective for more milk and greater economic returns. In India, cattle varying from purebreds to altogether non-descript types are found in different areas. Premier dairy breeds of cows maintained in the private and Government sectors in the country are Sahiwal, Red Sindhi, Tharparkar, Gir and Ongole. India possesses about 178.8 million cattle (Livestock Census, 1972). Annual milk yield per cow is about 173 kg (1966 Census), whereas in most of the developed countries like Denmark, U.S.A., U.K., Netherlands, Sweden and Israel the annual milk yield per milch cow ranges from 2,470 to 5,042 kg (F.A.O. 1969-70). The low milk yielding potential of indigenous cows may be mainly attributed to poor inheritance of economic dairy traits, inadequate feeding and improper management. With the present type of population of milch cattle and the various programmes aimed at their improvement, the annual milk production in India is 23.20 million metric tonnes (F.A.O. 1972-73). Today, India's human population is estimated at 547 million (1971 Census), and the per capita daily consumption of milk is 108 gm; whereas, the recommended minimum quantum is 275 gm for
vegetarians and 175 gm for non-vegetarians (I.C.M.R.). Thus, in order to provide the minimum quantum of milk per person per day, we would require to produce 55 million tonnes of milk per annum; and this production too would not be able to keep pace with the needs since the Indian population is increasing at the rate of 2.1 percent per annum.

Among the several scientific disciplines useful to the objective of improving efficiency of milk production in cattle, the science of genetics and its application to animal breeding has offered the scope of marked gains through inheritance. Genetic improvement in cattle for milk production and other important heritable traits is possible through adoption of a well planned breeding programme. Improvement based on an effective selection index is the most important tool with the dairy cattle breeder which he can use to take advantage of different types of gene action, to increase frequencies of most favourable genes and to bring about accumulation of the desirable characters for effecting improvement within the breed. To construct selection indexes involving desirable dairy traits for improving a particular herd, it is essential to conduct genetical evaluation of the herd for these traits as accurately as possible. The most important parameters which are estimated to know the genetic status of a herd for the desirable traits are the heritability, genetic correlations and relative genetic gain per unit of
time. For accelerating the genetic progress in annual milk production, selection based on early traits with correlated response, e.g., part records of milk yield need to be taken advantage of, if possible. Selection of breeding bulls is a matter of importance as well, because of possibilities of wide dissemination of its inheritance through artificial insemination.

The relative merit of the selection efficiency obtained on the basis of various combinations of part lactation records as compared to complete lactation records for faster genetic improvement in cows has been advocated, among others, by Gifford (1943), Randel et al. (1957), Searle (1961b and 1963) and Nagarakar (1964a).

Equally important is the need to start using breeding bulls of high genetic merit at an early date. This could be achieved, if accurate sire evaluation is possible on early part records relative to complete lactation records with a minimum number of unselected daughters per sire. The reliability of sire evaluation based on part lactation milk records of daughters has been investigated among temperate breeds of cattle by Heidhues et al. (1961) and Copeland (1963).

Gir is one of the important breeds of Zebu cattle, predominant in the western part of the Indian peninsula, Gir cattle breeders since long have been in pursuit of improv-
The objectives of the present investigation were:

1. To investigate heritability estimates of characters like age at first calving, lactation milk yield records - partial (10 monthly consecutive and cumulative yields for various periods of first lactation) and complete, life-time milk production, lactation length, dry period, calving interval, service period and gestation period.

2. To study repeatabilities of characters such as complete lactation milk yield, lactation length, dry period and inter-calving period.

3. To estimate genetic and phenotypic correlations among successive complete lactation milk yields.

4. To estimate phenotypic and genetic correlations among different periods of part and complete lactation milk production records of first lactation, as well as, life-time milk production.
5. To estimate phenotypic and genetic correlations between first complete lactation milk yield and certain other traits observed during first lactation.

6. To compare the relative efficiency of selection based on different lengths of part lactation milk yields.

7. To determine the minimum number of daughters needed to prove a sire on the basis of part lactation records.

8. To construct Selection Indexes on the basis of certain economic characters of first lactation.

9. To estimate incidence of characters such as birth weight (Sex-wise), abortion rate, rate of premature births and still-births, twining percentage and secondary sex-ratio.