INTRODUCTION

Dairying in India, over the years, has witnessed a sea change from a largely unorganized activity into a blooming organized industry. Dairy Industry is one of the fastest expanding industries in the world. India ranks first in world milk production, its production having increased from 17 million tonnes in 1950-51 to 121.8 million tonnes by 2010-11 (Economic Survey 2011-12). The demand for milk is projected to be 181 million tonnes by 2020 (India Vision 2020) which shall be further propelled due to increasing middle class population with high disposable income along with fast changing socio-economic and cultural values and health consciousness. Milk and milk products in India are consumed by 77.5 per cent of rural and 88.7 percent of urban households and these food items find an important place in their diets. The average monthly per capita expenditure on milk and milk products is Rs.60 and Rs.107 in rural and urban areas respectively (NSS 64th round).

The changing economic scenario throws open the challenges as well as the underlying opportunities to increase milk production with the help of scientific breeding, feeding and management of huge livestock wealth India possesses so that milk supply side matches the demand side effectively. Dairying in India has traditionally been a small holders' enterprise. As the demand for milk and milk product is increasing rapidly, milk producers have been adopting dairy farming on commercial scale to tap the market opportunities. The present study conducted on 40 commercial dairy farms in Ahmednagar district of Maharashtra (India) in the year 2009-10 analyses their capital investment, cost and returns and the profitability. The farms were classified into small, medium and large categories based on herd size. Small, medium and large dairy farms maintained 10.55, 14.11 and 34.66 milch animals respectively. The average investment per farm was estimated to be Rs. 12.17 lakhs. The share of dairy animals in total investment ranged from 51.28 % (small farms) to 70.12 % (large farms). The average productivity of cross-bred cattle was 9.72, 9.58 and 9.49 litres of milk per day for small, medium and large category of commercial farms; while per litre cost of milk production thereon were Rs. 12.49, Rs.12.58 and Rs. 11.48 respectively. The net return over cost per litre of cow milk produced was Rs. 2.16. All the farms were financially viable earning a net profit of Rs. 1,91,458 per farm per year.

Keywords: Commercial farms, Investment, Cost, Profitability
2005; Singh 2008) indicated that the share of investment on animal remains the highest followed by buildings and equipment.

Observing the cost of production is one of the foremost factors that one has to inevitably consider in accessing any commercial enterprise. The profit of the firm can be maximized either through maximization of returns or minimization of cost. Individual producer have little control over returns being largely dependent on external environment of the firm. Hence cost minimization is an important tool in the hands of entrepreneur through which profit could be maximized. The studies on the commercial dairy farms (Pant and Karanjkar 1965; Chand et al. 2002; Shergill 2006) reported that feed cost was the major cost component in the total expenses. There were a large inter farm-group variations regarding cost of milk production and earnings. The study on maintenance cost per milk animal (Autkar et al. 1995) showed that the major items of maintenance cost were feed, human labour and interest on working fixed capital.

DATA AND METHODOLOGY
Commercial dairy farming is being done in parts of western and eastern Maharashtra and has taken considerable momentum in the other parts of the state. Some regional trend in the growth of the dairy sector, in fact, suggests that there is a sufficient scope for further improvement in the dairy sector in Maharashtra. Ahmednagar district was selected purposively as it ranks first in milk production in the state and has well developed dairy infrastructure. Geographically the district is positioned at the centre of the state having easy access to some important markets like Mumbai, Thane, Pune, Nashik and Aurangabad cities. This led to establishment of a large number of commercial herds in the area.

Two tehsils, Sangamner and Rahuri from Ahmednagar district were selected randomly and from each tehsil, a cluster of six villages having maximum number of commercial dairy farms were identified. To select a sample of commercial farms, complete enumeration of commercial dairy farms in these villages was done. The commercial dairy farms based on herd size were categorized into three classes namely small, medium and large using cumulative square root frequency method of stratification. Finally 40 commercial dairy farms were selected on the basis of probability proportionate to the number of dairy farms in each category.

Primary data on various aspects of milk production enterprises were collected from each of the selected dairy units by personal interview method. The data were scrutinized, tabulated and subjected to tabular analysis. The following methodology was adopted to analyse investment pattern, cost of milk production and profitability on sample commercial dairy farms.

Capital Investment
The fixed investment on a commercial dairy farms comprised of investment on animals including milch animals, young stock and heifers, bulls and draft animals, investment on cattle shed and stores, machinery and equipments.

Costs and Returns Concepts
Fixed Cost: It includes interest on fixed capital and depreciation on animals, cattle sheds and machinery. The interest on fixed capital was worked out at the then prevailing rate of interest i.e. at 7.50 per cent per annum. Depreciation on fixed capital was worked out separately for milch animals, cattle shed, machinery and equipments keeping in view the present value and useful economic life of the capital asset.

Depreciation rate on milch animals was worked as follows:

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Depreciation rate per annum (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross- bred cows</td>
<td>8 per cent (productive life 12.5 years),</td>
</tr>
<tr>
<td>Local cows and Buffaloes</td>
<td>10 per cent (productive life 10 years),</td>
</tr>
</tbody>
</table>

Depreciation rates on cattle shed, stores and dairy equipments were applied as under

As the commercial dairy farm maintained animals of different species and age groups, to determine the relative share of fixed cost attributable to milch stock, the livestock maintained at the farm were converted into
Standard Animal Units (SAU's) as per the methodology suggested by Patel, R. K., et al. 1983. The fixed cost was apportioned on the basis of Standard Animal Units the following relative weights were assigned:

- Local cow = 1.00
- Crossbred cow = 1.40
- Buffalo = 1.30
- Crossbred heifer (> 1 yr.) = 0.75
- Crossbred heifer (> 2 yr.) = 1.00
- Buffalo/Local calves (> 1 yr.) = 0.50
- Buffalo/Local heifer (> 2 yr.) = 0.75
- Other calves (< 1 yr.) = 0.33

i) Variable Costs
These costs include feed cost, labour cost, veterinary cost and other miscellaneous costs.

- Feed cost: The cost incurred on green fodder, dry fodder and concentrate to feed the animals constituted feed cost. It was worked out by multiplying quantities of feeds and fodder consumed by animals with their respective prevailing prices in the study area. All the commercial farms adopted collective stall-feeding of their animals. To apportion the joint costs on feeds and fodder, standard animal units approach was applied.
- Labour Cost: It included family as well as paid hired labour. The hired labour was calculated considering time utilised in various dairy activities and wages paid. In case of family labour, the imputed value was taken as per the prevailing wage rate of casual labour in the study area.
- Veterinary Cost: It included the cost incurred on natural service, artificial insemination (A.I.), vaccination, medicines and other charges/fees of veterinary doctors.
- Miscellaneous Costs: The cost on repairs, electricity, water charges, bucket, rope, etc. formed this group.

ii) Gross Cost: It was obtained by adding all the cost components included in the fixed and variable costs, i.e.

\[
\text{Gross Cost} = \text{Total Fixed Cost} + \text{Total Variable Cost}
\]

iii) Net Cost: The net cost was reckoned by deducting the imputed value of dung, from the gross cost, i.e.

\[
\text{Net Cost} = \text{Gross Cost} - \text{Imputed value of dung}
\]

iv) Cost per Litre of Milk Production
In order to estimate the cost per litre of milk, the average net maintenance cost per animal per day was divided by average milk production per animal per day, i.e.

\[
\text{Net maintenance cost per animal per day} / \text{Total milk produced per animal per day}
\]

v) Gross Returns:
Gross returns were obtained by multiplying milk yield of an individual animal with respective prevailing price of milk in the study area, i.e.

\[
\text{Gross Returns} = \text{Quantity of milk} \times \text{Market price of milk}
\]

Price of Milk: The price of milk differs according to type of milk and the season. The weighted average price of milk was calculated for each commercial farm as under:

\[
\text{Weighted average price} = \frac{\sum P_i \times W_i}{\sum W_i}
\]

Where,
- \(P_i\) is the price per litre of \(i\)th type of milk, and
- \(W_i\) is the total quantity in volume of \(i\)th type of milk sold by the farm.

Net Returns:
Net returns were calculated by subtracting net cost from gross returns, i.e.

\[
\text{Net Returns} = \text{Gross Returns} - \text{Net Cost}
\]

Profitability
The profitability of each category of farm was worked out on the basis of milk supplied to various agencies, milk retained at home and net returns over cost per litre of milk produced.

RESULTS AND DISCUSSION
The number of commercial dairy farms selected in each category is presented in the Table 1. Socio-Economic Profile of the Commercial Farms
The information relating to family size, educational status, land holding etc. of the dairy owners have been analysed and presented below in Table 2.
The average size of family on commercial farms was 12.5 members. The average number of family members was observed to be maximum on medium farms (15.10) whereas this figure in case of small and large farms was 11.10 and 11.34 members respectively. Educational status was operationalized as the level of formal education attained by the individual respondent as followed by Bhuvaneshwari (2005)*. The mean education score of the head of the commercial dairy farm is lowest (3.54) in case of small category and highest (5.0) for large category of sample dairy farms. The overall mean educational score was 4.25, which suggests that most of the heads of the sampled farms had high level of formal education.

The average operational land holding for small, medium and large farms was 4.83 hectares, 5.52 hectares and 15.24 hectares per commercial farm respectively. Majority of commercial farms on an average own more than 4 hectares of land. As far as area under fodder crops is concerned, it was interesting to observe that area devoted for fodder cultivation increased with the farm size to meet the higher demand for fodder. The proportion of operational land holding used for growing fodder was highest for medium category (28.63%) followed by small (24.86%) and large (15.09%) farms. The commercial farms on an average had about 21% of their operational land holding reserved for fodders only.

### Herd Type
Type of the herd adopted on the commercial farms is an important indicator of the preference of dairy owners of a particular region for a particular breed/species. Data regarding type of farm maintained on the sample commercial farms is presented in Table 3.

These commercial farms have been classified as pure cattle farm i.e. the farms which maintained only cattle i.e. both, either crossbreds and/or local cows. The mixed farms were those commercial farms which kept a mix of cattle and buffaloes or only crossbred cattle herds and buffalo herds. It can be seen that, maximum farms were found to be pure cattle farms (92.50 %) whereas mixed farms were only 7.50 %. Most of the small farms were found to be pure cattle farms and only one farm in this category was found to be a mixed farm. In medium category of commercial farms, all farms were found to be cattle farms maintaining cross-breds only. In case of large category of farms again seven out of nine farms were pure cattle farms.

It was particularly interesting to observe here that, amongst the sampled commercial farms not a single farm had local cow in its milch stock. It emerged prominently that the main reason for not maintaining local cattle in the milch stock is the low productivity of the local cow. The exotic breeds of animals which were observed on the sample farms included Holestien Fresian (HF) and Jersy crosses. High grade

### Table 1: Selection of Sampled Commercial Farms in Ahmednagar District

<table>
<thead>
<tr>
<th>Category</th>
<th>Total number of commercial dairy farms</th>
<th>Farms selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small (10 to 12 milch animals)</td>
<td>115</td>
<td>22</td>
</tr>
<tr>
<td>Medium (13 to 15 milch animals)</td>
<td>46</td>
<td>9</td>
</tr>
<tr>
<td>Large (16 and above milch animals)</td>
<td>48</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>209</td>
<td>40</td>
</tr>
</tbody>
</table>

### Table 2: Category-wise Family Size, Education status and Land holdings of the Sample Commercial Farms

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of farms</th>
<th>Average Family size</th>
<th>Education status of head of farm*</th>
<th>Land holding per farm (ha.)</th>
<th>Percentage of area devoted for fodder crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>22</td>
<td>11.1</td>
<td>3.54</td>
<td>4.83</td>
<td>24.86</td>
</tr>
<tr>
<td>Medium</td>
<td>9</td>
<td>15.1</td>
<td>4.22</td>
<td>5.52</td>
<td>28.63</td>
</tr>
<tr>
<td>Large</td>
<td>9</td>
<td>11.3</td>
<td>5.00</td>
<td>15.24</td>
<td>15.09</td>
</tr>
<tr>
<td>Overall</td>
<td>40</td>
<td>12.5</td>
<td>4.25</td>
<td>7.32</td>
<td>20.92</td>
</tr>
</tbody>
</table>

*mean education score worked out as followed by Bhuvaneshwari
Murrah buffalo was the preferred breed amongst majority of the commercial farms which had maintained buffaloes.

**Investment Pattern**

Level of investment reflects the extent of business activity and its income generating capacity in the long term. On the commercial dairy farms, fixed investment comprised of investment on animals, cattle shed and stores, machinery and equipments etc. The total capital investment on various heads across commercial dairy farms is reflected in Table 4. The average capital investment per farm on sample commercial farms was found to be Rs 12.17 Lakhs indicating that commercial dairy farming is a highly capital intensive business. The dairy animals alone constituted nearly 56.40 percent of total investment followed by cattle sheds and stores (36.92%) and machinery and equipments (6.68%).

The breakup of animals according to their kind revealed that milch animals constituted 44.11 percent, heifers 8.12 percent, young animals below one year nearly 3 percent and draft animals 1.45 percent of the total investment on livestock. The investment on milch animals in absolute terms on an average was Rs. 6.40 lakhs due to quality breeds of animals reared and high prices of crossbred cattle and buffalo in the region.

Across different commercial farm size categories, the pattern of investment was observed to be almost similar, but its magnitude differed considerably. As expected, the overall investment in fixed capital increased with the farm size. The share of dairy animals in total investment was found to be 51.28 percent on small farms,
55.19 percent on medium farms and 70.12 percent in case of large farms.

It can be concluded from the analysis that the large farms have invested maximum share of their fixed capital in the dairy animals whereas on the small farms relatively more investment was done on the development of infrastructure. This is due to different pattern of housing used on different categories of commercial farms.

**Cost and Returns from Milk Production**

The maintenance cost of a milch animal includes cost on feeds and fodder, human labour, interest and depreciation on fixed assets and miscellaneous recurring expenses less income from dung. A detailed component wise cost of milk production is presented in Table 5. The analysis is done separately for different species of milch animals to have a better insight of species wise economics of milk production.

The overall gross cost of maintenance of a cross-bred milch cattle on small category of sampled farm was estimated to be Rs. 126.43 per day. The variable cost was about 83 per cent of the gross cost whereas the fixed cost component was 17 per cent. Cost on feeds and fodder was the major cost component, which formed about 69 percent of the total cost of maintenance.

The average milk yield of cross-bred milch animal on small farms was found to be 9.72 litres per day. The overall cost per litre of milk was found to be Rs. 12.49. As far as returns from the dairy animals are concerned, milch animal gave, an
overall net return of Rs. 15.27 per animal per day, whereas the net returns per litre of milk was Rs. 1.57.

The gross cost of maintenance of crossbred milch cattle on medium category of commercial farms was estimated to be Rs. 125.67 per animal per day. The share of total fixed cost and total variable cost in the total cost on these farms was 16.37 percent and 83.63 percent respectively. The average milk yield of crossbred milch animals on medium farms was found to be 9.58 litres per day resulting into overall cost of milk production at Rs. 12.58 per litre. The milch animals could generate a net return of Rs. 13.03 per day generating a surplus of Rs. 1.36 with each litre of milk produced. The gross cost of maintenance of a crossbred milch cow on the large category of sample farms was Rs. 114.08 per day in which fixed and variable costs shared 18.18 per cent and 81.82 per cent of total cost respectively. The feeds and fodder cost accounted for around 70 percent of the gross cost. In feeding cross-bred milch animal the cost incurred per day on green fodder, dry fodder and concentrates was Rs.28.04, Rs.19.11 and Rs.32.68 respectively.

The average yield per milch animal on large farms was found to be 9.49 litres per day and the net cost milk production was worked out to be Rs.11.48 per litre against the average sale price of milk of Rs.14.79 per litre. On this category of farms each milch animal yielded an average net return of Rs. 31.28 per day which turns out to be Rs. 3.30 per litre of milk produced. It could be inferred that feeds and fodder being the major cost items of cattle maintenance they had profound effect on the economies of commercial dairy farms.

The study revealed that the net cost of milk production in case of cross-bred was found highest on the medium category of commercial farms and lowest in the large category. This was due to higher cost incurred on feeds and fodder on medium farms. The large farms were found to be more economical in terms of manpower utilization. The net cost per litre on sampled commercial farms worked out to be lowest in the large category and highest in the medium category.

Maintenance cost of milch buffalo on large commercial dairy farms was Rs.105.12 per animal per day in which variable costs accounted for about 80.08 per cent of the cost of maintenance. A relative lower cost on concentrates fed resulted into lower cost of maintenance. However due to a significant number of animals gone dry at these farms the average milk productivity per milch animal turned out to lower causing milk production cost to escalate to Rs. 26.28 per litre. Returns from the buffaloes on large commercial farms showed that each milch buffalo earned overall a net return of Rs. 2.66 per day. Though buffalo milk fetches a good price in the region, i.e. Rs. 27.50 per litre, the overall net returns were relatively low contributing to the extent of Rs. 0.72 per litre of milk.

**Profitability of Commercial Dairy Farms**

To work out category wise profitability of commercial dairy farms cost and returns were worked out which are presented in Table 6.

It may be observed from the table 6 that small category of commercial dairy farms generated a net surplus of Rs. 1,92,898 per annum whereas the medium category of farms lagged behind with a surplus of Rs 67,216, the obvious reason was found to be that they had stock of more number of dry animals which eat in to their profits. The large commercial farms earned net profit of Rs. 3,12,178 per year. All the farms were found to be financially viable, earning net profit of Rs. 1,91,458 per year.

**CONCLUSIONS**

Commercialisation in dairy farming has contributed to increase in income levels of commercial dairy farms in Maharashtra.
farmers through increased production. The productivity of cattle in terms of milk production per milch cattle per day as well as wet average was found higher in small commercial farms in comparison to medium and large farms in that order. The average capital investment on sample commercial farms was worked out to over Rs. 12.16 Lakhs per farm indicating that commercial dairy farming is a highly capital intensive business. It can be concluded from the analysis that the large farms have invested maximum share of their fixed capital in the dairy animals whereas on the small farms relatively more investment was done on the development of infrastructure. Commercial dairy farms had devoted fairly large area of their operational land holding for growing fodder crops so that they could meet their fodder requirement and were little dependent on purchased fodder. Feed represented one of the largest cost components within dairy farming and was an obvious cost to be reduced. The wet to dry animal ratio was better in case of crossbred cattle farms as compared to the buffalo farms. Poor wet to dry ratio led to increased cost and relatively low returns on the large buffalo farms.

REFERENCES


