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# Milk Recording and Genetic Improvement of Sunandini Cows in Kerala

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India has emerged as the second largest milk producer in the World, with an estimated production of 69 million tons. The milk production is growing at an average rate of 6.9% annually since 1981-82. About 55% of the total milk produced in the country are from buffaloes. The crossbreeding programme taken up for converting the non-descript local cattle to crossbred using exotic dairy breeds, mainly Jersey and Holstein Friesian, has yet to stamp its impact in the milk production scenario of the country.

Exception to this general pattern is the milk production programme in Kerala where almost 90% of the milk produced is from cattle and the remaining shared equally between buffaloes and goats. Kerala is one of the states of India, having an area of 38 883 km<sup>2</sup> and forming 1.2% of the total area of the country. This state popularly described as God's own land is green all through the year, densely populated (747 people/km<sup>2</sup>) with 90% literacy, and cultivated intensively with cash crops and spices. However, dairying was not worth mentioning an occupation of the people and the cattle belonged to the local non-descript variety yielding less than 400 kg milk annually. But intensive efforts that started from early seventies have significantly altered the milk production sector of the state as can be seen from table 1.

Table 1. Indicators of growth in the dairy sector in Kerala (1970-1996)

Parameter	1977	1996	% growth/year
Total cattle & buffalo population (million)	3.46	3.56	0.16
Breedable female cattle population (million)	1.37	1.80	2.24
Percentage of crossbred cattle	45.07	67.33	2.48
No. of adults buffaloes	0.16	0.06	-3.32
Ratio adult male to female	0.213	0.074	-3.43
Milk production (m. tons)	0.78	2.42	11.07
Av. first std. lactation milk (kg) of CB cows	1480	2196	3.72
Milk availability g/day/person	87	197	6.65

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## 1. Introduction

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This paper presents the milk recording programme implemented in the state for enabling the genetic selection among bulls used in artificial insemination.

**2. Cattle Breeding operations in Kerala**

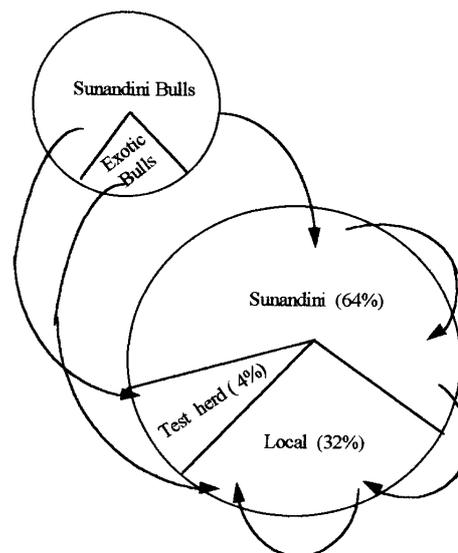
**2.1 Breeding programme**

Crossbreeding of the local non-descript cattle and subsequent inter mating, between crossbreds is followed, since early 1970 with AI using frozen semen as the means to propagate the germplasm, under the organised sector. The breeding operations of the state is explained in figure 1.

AI net work is estimated to cover around 45 to 55% of the population and the remaining is left with non-selected bulls, both Sunandini and local, for carrying out natural service.

Jersey and Holstein Friesian are the exotic breeds used for breeding the local cows. They are procured from best sources from India and abroad. Sunandini cows are bred with Sunandini bulls produced and selected from within the breed. Around 160 Sunandini bulls and 80 exotic bulls are maintained for the AI programme of the state.

The bulls are maintained in the bull stations for an average period of four years. Annually around 2.5 million doses of frozen semen are produced of which 1.6 million doses are utilised with in the state and the remaining sold in other states of the country.



*Figure 1. Breeding operations of the State.*

Forty bulls, which have completed production of the required number of doses, are replaced every year. The young Sunandini bulls required for replacement are produced through:

- Nominated mating of elite cows maintained in the bull mother farms of the KLD Board using proven Sunandini bulls' semen 40%
- Nominated mating of the elite cows identified among the cows belonging to farmers in milk recording area using Sunandini bulls' semen 47%
- MOET of the top elite cows 5%
- Mating of registered zebu cows with imported semen of HF and Jersey breeds 8%

All the young bulls entering the semen production programme are put to progeny testing using around 4% of the total cattle population of the state. The operation of progeny testing programme is explained in figure 2.

The production and distribution of frozen semen for AI in Kerala is the responsibility of the state owned company, the KLD Board. They have bull mother farms, calf rearing stations, semen production and semen distribution stations for the above purposes. Altogether about 800 animals are maintained at these stations. Information on growth, reproduction, disease aspects and production of the stock are maintained systematically and analysed periodically enabling for genetic selection and productivity and production improvement. Management of information at these centres is fully computerised. Bull mothers are selected based on the most probable production ability, where each cow is given weight for its age at first calving, calving number and compared with its contemporaries through year and season.

The test herd is spread in an area of about 1 200 km<sup>2</sup>, maintained in three agro climatic zones and controlled by 50 artificial insemination centres. The total breedable Sunandini population in the area is about 80 000. All Sunandini cows in the area are permanently identified using metal eartags and registered in the livestock register maintained at the AI centre. Insemination using semen of test bulls and its follow up till calf birth is the responsibility of the AI technician. The female calves born out of test A.I. are identified and followed up at intervals of six months and their heart girth circumference measured and recorded. When such animals calve, their milk yield is recorded on monthly basis morning and evening for 10 consecutive months or till cessation of the lactation. Unemployed youth and workers of the adjacent milk societies are engaged for the above works paying on quantum basis. A supervisor monitors the work of six such milk recorders. The data obtained is fed to the computer. On an average, record of 5 400 female calves are collected annually. These milk recorders also collect the milk yield of about 2 000 first calves. Due to

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## 2.2 Selection of Sunandini bulls

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## 3. Data collection

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### 3.1 Bull mother farms and semen production stations

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### 3.2. Data from farmers cows

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#### 3.2.1 Facilities built in for data collection and compilation

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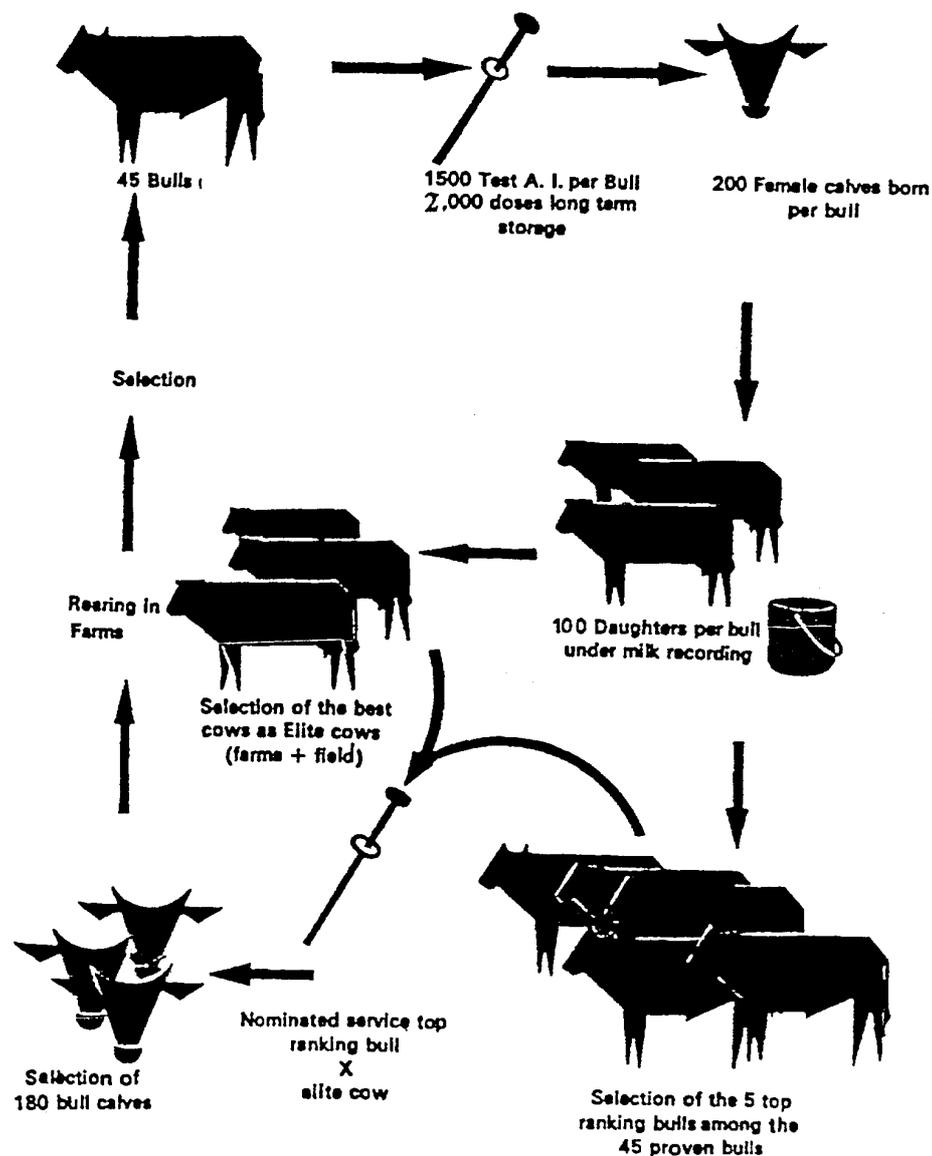


Figure 2. Functional flow chart of progeny testing scheme.

reasons like migration of animals, sale, etc. only 28.3% of the animals identified as calves, are ending up with a completed first standard lactation (Please see table 2).

Table 2. Animals completing first standard lactation out of female calves identified (1984-96)

	Number	%
Total no. of female calves identified	56 922	
No. of cows enrolled for milk recording	21 061	37.01
No. of cows completing first lactation	16 124	28.33

Information on the age at first calving, milk production, feeding and management of the animals born for test mating is collected from the field. This information is used for sire evaluation carried out by the KLD Board, for selection of elite cows in the field and for the planning exercises of the state.

All the female progenies born through test inseminations in the milk recording area are identified using metal ear tags. These calves are followed up on a half yearly interval. In addition to making sure that the animals are available, the average heart-girth circumference are measured and recorded at the time of every visit. The average heart girth circumference of the Sunandini calves recorded during the period 1984-1997 classified according to age group is given in table 3.

From table 3, it can be seen that the average heart girth circumference of the Sunandini female calves in the field increased by 36% during the period from one month of age to 36 months. The rate of increase is faster from three months of age onwards.

### 3.2.2 Information on growth

Table 3. Average heart girth circumference (cm) of Sunandini females in the field (1984-1997).

Age (days)	Number	Mean	S.D.	% increase
<31	17 673	73.16	5.94	
31-60	31 392	74.65	5.74	2
61-90	10 750	77.36	6.67	6
91-180	13 457	91.7	11.58	25
181-365	46 159	99.39	12.37	36
366-730	78 027	116.79	14.52	60
731-1096	58 576	135.11	14.08	82
>1096	58 309	141.40	12.35	93

On an average, 2 000 animals are registered annually for recording of their first lactation milk yield. The average age at first calving of these cows according to year of calving is given in table 4. It may be seen from table 4 that the age at first calving has gradually reduced from 41.6 months to 39.6 months during the period from 1983 to 1996. Though this is to be considered as a positive development on account of the improvement in the management given to the cows in the field, the age at first calving obtained for the cows belonging to the farmers are far too high in comparison to the average first calving age recorded for Sunandini cows in the bull mother herd maintained by the KLD Board. The analysis of the age at first calving of the cows according to the agro-climatic zones revealed that it is significantly higher in the high land and the lowest average age was noticed for the animals maintained in the coastal region.

An analysis of the milk recording data collected from about 2 000 first calvers annually indicates that there is a steady increase in average lactation yield of the Sunandini cows over the years. The average first standard lactation milk yield of the Sunandini cows classified according to geographic zones and year is given in table 5. The average annual increase is to the tune of 3.72%. The average annual increase registered is 3.41%, 3.89% and 5.1% respectively in the coastal, midlands and highlands. All through the years, mid lands had the highest lactation yield followed in order by coastal regions and highland.

*Table 4. Average age at first calving of Sunandini cows according to year of calving.*

Year of calving	Count	Mean	S.D.
1983	1 621	41.6	8.1
1984	1 768	40.1	9.1
1985	1 865	40.2	7.8
1986	1 942	41.2	7.7
1987	1 987	41.8	8.8
1988	2 076	41.6	8.9
1989	1 787	40.6	8.6
1990	2 039	40.0	7.4
1991	3 017	40.3	8.5
1992	1 700	40.3	7.9
1993	1 823	40.6	6.5
1994	1 870	40.9	8.2
1995	1 766	39.6	8.4
1996	1 324	39.6	6.8

Table 5. First standard lactation milk yield (kg.) of Sunandini cows in the milk recording programme according to year of calving and agro-climatic zones.

Year	Coastal		Midland		Highland		All	
	Count	Mean	Count	Mean	Count	Mean	Count	Mean
1983	1 214	1 507	195	1 549	212	1 269	1 621	1 480
1984	1 134	1 673	382	1 603	247	1 404	1 763	1 640
1985	1 089	1 724	548	1 646	228	1 456	1 865	1 669
1986	1 124	16 971	606	1 691	212	1 672	1 943	1 691
1987	1 142	1 700	544	1 745	301	1 801	1 987	1 726
1988	1 209	1 687	576	1 804	290	1 843	2 196	1 749
1989	988	1 753	500	1 792	299	1 873	1 988	1 796
1990	1 172	1 803	613	1 741	354	1 854	2 039	1 706
1991	1 822	1 803	753	1 787	441	1 928	3 017	1 833
1992	976	1 823	432	1 893	292	2 073	1 700	1 960
1993	1 114	1 916	386	2 049	323	2 030	1 823	1 985
1994	1 165	1 996	380	2 202	352	2 042	1 897	2 046
1995	1 193	2 138	343	2 171	291	2 075	1 827	2 134
1996	924	2 176	222	2 333	222	2 115	1 368	2 192

*Table 6. Average first standard lactation milk yield of Sunandini cows according to the level of feeding. (Period 1995-1996).*

D.C.P.	Total digestible nutrients		
	Low	Optimum	High
Low	2 213	2 236	2 252
Medium	2 285	2 308	2 324
High	2 251	2 273	2 290

The increase in milk production as registered among the cows in the milk recording area is also noticed in the overall milk production of the state, which has during the same period registered an average annual increase of 8.3 percent. This increase is a combined effect of the increase in the per animal production of the Sunandini cows as well as an increase in the number of Sunandini cows.

From 1985 onwards, data on feeding and management practices followed in the milk recording area are collected. An analysis of the above data for the period 1995 & 1996 indicated that maximum yield was obtained when the animals are fed with optimum DCP and high TDN.

The average standard lactation milk yield obtained under different nutrient plains with respect to TDN and DCP are given in table 6.

It is also noticed that the farmers have a tendency to over feed their animals with DCP, whereas the energy levels are found to be below optimum. More than 47% of animals are under fed with respect to TDN.

### **3.3 Application of milk recording in the field**

The data obtained from the field on the milk yield of the Sunandini cows are used mainly for the sire evaluation programme. 40 bulls are put to progeny testing every year and 4-5 bulls out of them are selected as proven and employed in the breeding programme as fathers of next generation bulls. The milk recording data also helps to identify superior cows belonging to farmers. Around 500 elite cows are identified and maintained in the stock and these cows are mated to proven bulls to produce the next generation young calves. As stated earlier, 47% of the young bulls entering into the programme are produced from the elite cows belonging to the farmers. The milk recording data also gives vital information for the planning purpose of the state.

Dairying continues to be a subsidiary occupation for the majority of the farmers of the country. As such, they do not give much importance for the keeping of records regarding their dairy production programme. The farmers are yet to find a use for the records and this makes the milk recording programme not a welcome one but an imposed hazard. The average farm size in Kerala is to the tune of 1.3 adult animals. This also creates difficulties in expanding the milk recording programme to more areas. To make the milk recording more effective, efficient and farmer friendly, it is necessary that regulatory mechanisms to make milk recording statutory be implemented. The farmers should also get the benefit of the milk recording programme for increasing the productivity of animals. Effective feedback of information supported with extension activities to effectively use it will go a long way in popularising the milk recording programme.

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#### **4. Issues connected with milk recording in the field**

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