

## Productivity dynamics of Livestock in southern peninsular India: A Compound growth rate analysis

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### Abstract

Although India possesses the large volume of livestock, their productivity is abysmally low at global level. India, with its wide variation in geo-ecological parameters, elucidates a high variation in the productivity of its livestock, among regions. The compound growth rate of livestock productivity was worked out for the Southern Peninsular state of India, Tamil Nadu. The average productivity of milk in cross bred cows and buffaloes in Tamil Nadu was less than the national average, while the productivity desi cows was a bit a more. The annual compound growth rate of milk productivity among crossbred cows of Tamil Nadu was at meager 0.54 per cent during the period between 1998-1999 and 2006-2007, whereas the productivity of milk in desi cows had improved from at an annual compound growth rate of 1.29 per cent. Notably, the milk productivity in buffaloes had declined at a rate of 0.29 per cent during the period under study. The annual compound growth of egg productivity in improved hens of Tamil Nadu was 20.87 per cent. The average annual productivity was 109.531 eggs, which improved from 70.623 in 1998-1999 to 197.084 in 2004-2005. Correspondingly, the productivity of desi hens also had a positive swing from the year 2003-2004 onwards. The results implied that the simulation of increased productivity, better farm financing and improved milk marketing could result in enhanced livestock production that would meet the future demands.

Key Words: Productivity, Growth rate, Crossbred, Desi Cows, Buffaloes, Hens

### Introduction

Livestock produce food, provide security, enhance crop production, generate cash incomes for rural and urban populations, provide fuel and transport, and produce value added goods which can have multiplier effects and create a need for services. Furthermore, livestock diversify production and income, provide year-round employment, and spread risk. Livestock also form a major capital reserve of farming households. Because of livestock's contribution to societies, human and economic pressures can direct livestock production in ways detrimental to the environment (FAO, 1996).

India ranks first in cattle and buffalo population, second in goat, third in sheep and seventh in poultry across the world. Although the population of livestock during last 10 years has been stable around 485 million, the buffalo population has increased by 8.91 per cent, while the cattle population has reduced by 6.89 per cent. There has been a significant increase in the population of goats during the last five decades, which is attributed to the decrease in the size of land holdings and persistent drought caused by erratic

monsoon, forcing many small farmers to shift from large animals to small ruminants (Hegde, 2006).

Growing human population, increasing urbanisation, rising domestic incomes and changing lifestyles in the country have led to increasing demand for livestock products. With regard to the demand for milk, it has been estimated that by 2020, the country will need about 175 million tons of milk per annum. Milk being an important source of protein in India, particularly in rural areas, the demand for milk is likely to increase with the increase in rural prosperity (Prabu, 2008). The demand for meat is likely to increase significantly because of increase in local consumption and severe shortage of meat in the Far East and South East Asian countries, opening an excellent opportunity for export. While looking at the world scenario, India has about three times as many dairy animals as the USA, which produces around 75 million tons, over 80 percent being kept in herds of 2 to 8 animals. Annual milk yield per dairy animal in India is about one tenth of that achieved in the USA and about one fifth of the yield of a grass-fed New Zealand dairy cow (Hemme et al., 2003).

Table-1.: Productivity trends in crossbred cows

District	Productivity in litre (per day)									ACGR (%)	
	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007		Average
Chennai	8.900	7.176	6.420	7.041	6.170	7.625	6.236	5.708	5.945	6.802	(3.73)
Coimbatore	5.616	5.548	5.799	6.053	6.462	6.328	6.267	7.162	7.068	6.256	3.19
Cuddalore	4.657	4.777	5.434	6.489	6.425	6.765	5.676	6.609	6.347	5.909	3.98
Dharmapuri	5.688	5.273	5.904	6.226	6.646	6.693	6.456	6.507	6.646	6.227	2.54
Dindigul	5.779	5.851	5.891	6.752	6.143	7.343	6.557	6.081	5.797	6.244	0.71
Erode	5.614	5.773	6.117	6.769	6.088	4.723	6.272	6.462	5.995	5.979	0.49
Kanchipuram	5.831	5.845	5.240	6.068	6.202	5.663	6.075	6.097	5.502	5.836	0.20
Kanyakumari	7.231	7.520	6.749	6.695	6.263	6.586	6.719	6.375	7.699	6.871	(0.45)
Karur	5.744	5.428	5.399	6.160	5.950	5.073	5.528	6.458	6.955	5.855	1.92
Madurai	6.026	6.471	6.140	6.589	6.336	6.013	6.157	6.331	6.196	6.251	(0.07)
Nagapattinam	5.493	5.455	5.481	6.158	5.832	5.149	6.190	5.946	6.481	5.798	1.65
Namakkal	7.185	7.320	6.660	6.278	5.962	4.864	6.012	6.456	6.362	6.344	(2.18)
Perambalur	5.755	5.898	5.909	6.094	6.183	6.247	6.680	6.392	6.308	6.163	1.47
Pudukkottai	5.403	5.490	5.738	6.090	5.942	4.805	6.232	5.706	5.600	5.667	0.31
Ramanathapuram	6.291	6.710	6.000	6.069	5.873	5.146	5.740	6.362	5.539	5.970	(1.53)
Salem	7.092	6.889	6.562	6.324	6.307	6.843	5.943	6.383	6.287	6.514	(1.37)
Sivagangai	5.687	6.211	5.504	6.355	6.553	6.176	5.309	6.088	5.363	5.916	(0.66)
Thanjavur	5.271	5.457	5.526	6.318	5.938	5.096	6.327	5.837	6.235	5.778	1.56
The Nilgiris	9.764	9.043	7.423	6.524	6.465	6.737	6.914	6.641	7.281	7.421	(3.62)
Theni	6.260	6.942	6.981	6.513	6.195	7.188	6.890	7.284	6.857	6.790	0.97
Thiruchirappalli	5.796	5.796	5.821	6.352	6.187	6.319	6.190	6.117	6.300	6.098	1.03
Thiruvallur	5.873	5.686	5.837	6.021	5.892	6.732	5.981	5.930	5.818	5.974	0.42
Thiruvannamalai	5.696	5.712	5.771	6.056	6.000	5.845	6.371	6.577	6.741	6.085	2.12
Thiruvavur	5.465	5.788	5.632	6.280	5.937	4.926	5.885	5.953	5.877	5.749	0.37
Thoothukudi	6.687	6.598	6.554	6.127	6.360	8.059	6.461	5.908	5.629	6.487	(1.28)
Tirunelveli	4.263	4.177	4.814	6.085	5.515	5.485	6.047	6.277	6.506	5.463	5.59
Vellore	4.941	4.862	5.770	6.113	5.892	6.371	6.334	7.215	6.271	5.974	4.02
Villupuram	6.975	7.769	6.569	5.656	6.070	6.019	6.178	5.665	5.650	6.283	(3.04)
Virudhunagar	4.275	3.891	4.946	6.279	6.548	7.794	6.808	6.114	5.869	5.836	5.97
State	6.043	6.047	5.951	6.294	6.150	6.159	6.222	6.298	6.246	6.157	0.54

In order to meet the domestic consumption requirements, it becomes imperative to augment our livestock production. However, inadequate availability of feed and fodder is a major constraint in promotion of animal husbandry in the country and the state. It has been estimated that only 880 million tons of dry fodder was available including greens, which can meet only 35-40 per cent of the demand. This clearly indicates that as most of the livestock are unfed, they are not able to perform optimally. Notwithstanding the accomplishments in milk production, the productivity of our cattle has been extremely poor. The average milk yield of cattle in India is far below the yield in other countries. Hence, boosting the productivity of our livestock to a newer height is mandatory.

In this context, this paper attempts to illustrate the productivity levels dairy animals and poultry in Tamil Nadu, besides elucidating their growth over years.

#### Material and Methods

Data: The data used in this study were gathered from secondary sources. Year wise, species-wise and district-wise data on livestock production for the

period from the year 1998-99 to 2006-07 were collected from various issues of sample survey reports of Department of Animal Husbandry, Government of Tamil Nadu and Annual Statistical Abstracts of Tamil Nadu of Department of Statistics, Government of Tamil Nadu.

Compound growth rate analysis: In order to study the spatio-temporal productivity dynamics of livestock in different districts of Tamil Nadu, the exponential growth equation of the following form was used to compute the annual growth rates of productivity of livestock products:

$$\ln Y_t = a + \beta t +$$

Where,

$Y_t$  = Productivity

$a$  = Constant

$t$  = Number of years; 1, 2, 3, ..., n

$\beta$  = Parameter to be estimated

$m$  = Error term

The compound growth rate was found out by using the formula:

#### Results and Discussion

Productivity trends in crossbred cows: Milk Productivity and productivity growth in crossbred

Table-2.: Productivity trends in Desi cows

District	Productivity in litre (per day)										ACGR (%)
	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	Average	
Chennai	2.604	2.801	2.785	2.647	2.401	2.508	3.006	2.601	2.356	2.634	(0.87)
Coimbatore	2.088	2.151	2.505	2.634	2.419	3.019	2.363	3.127	3.228	2.615	4.93
Cuddalore	2.587	2.720	2.738	2.606	2.392	2.775	2.230	2.925	2.384	2.595	(0.76)
Dharmapuri	2.595	2.734	3.288	3.521	2.742	2.648	2.844	2.817	2.630	2.869	(0.72)
Dindigul	2.778	2.787	2.631	2.564	2.611	2.225	2.346	2.539	2.446	2.547	(1.91)
Erode	2.538	2.597	2.627	2.646	2.574	2.562	2.946	2.879	2.262	2.626	0.08
Kanchipuram	2.295	2.373	2.593	2.580	2.632	2.879	2.932	2.869	2.748	2.656	2.78
Kanyakumari	2.043	2.736	2.846	2.758	2.570	2.483	2.621	2.425	3.121	2.623	1.79
Karur	2.483	2.597	2.960	3.151	2.754	3.046	2.719	2.658	2.191	2.729	(1.05)
Madurai	2.612	2.641	2.754	2.581	2.574	3.114	2.857	3.388	2.974	2.739	2.58
Nagapattinam	2.000	2.308	2.580	2.588	2.533	3.203	2.687	2.741	3.094	2.637	4.35
Namakkal	2.657	2.905	3.160	3.167	3.017	2.144	2.206	3.131	3.324	2.857	0.02
Perambalur	2.524	2.752	2.399	2.471	2.294	2.576	2.771	2.736	2.854	2.597	1.35
Pudukkottai	2.481	2.612	2.666	2.724	2.679	2.689	2.762	2.769	2.660	2.671	0.86
Ramanathapuram	2.612	2.647	2.649	2.560	2.396	2.719	2.588	2.875	2.565	2.623	0.32
Salem	2.678	2.739	2.968	3.144	2.493	2.564	2.648	3.008	2.793	2.782	0.03
Sivagangai	2.215	2.218	2.380	2.216	2.727	2.980	2.672	2.925	2.519	2.539	3.17
Thanjavur	1.974	2.018	2.393	2.642	2.235	2.136	2.264	2.244	3.120	2.336	3.09
The Nilgiris	2.934	2.943	2.841	2.577	2.591	2.633	2.639	2.638	2.975	2.752	(0.66)
Theni	2.716	2.934	3.331	3.460	2.621	3.139	2.555	3.201	3.497	3.050	1.08
Thiruchirappalli	2.527	2.560	2.627	2.581	2.540	2.633	2.666	3.281	3.606	2.780	3.76
Thiruvallur	2.294	2.458	2.624	2.698	2.559	2.484	2.537	2.893	2.957	2.612	2.28
Thiruvannamalai	2.645	2.808	2.719	2.669	2.695	3.326	2.877	3.010	3.105	2.873	1.99
Thiruvarur	2.246	2.352	2.552	2.378	2.255	2.553	2.696	3.081	2.956	2.563	3.54
Thoothukudi	2.336	2.236	2.323	2.554	2.560	1.852	2.415	3.500	2.675	2.495	2.78
Tirunelveli	2.327	2.557	2.554	2.495	2.568	2.456	2.549	3.296	2.790	2.621	2.48
Vellore	2.684	2.754	2.713	2.636	2.503	2.317	2.580	3.315	3.053	2.728	1.41
Villupuram	2.747	2.791	2.689	2.595	2.496	2.403	2.951	2.556	2.415	2.627	(1.11)
Virudhunagar	2.400	2.831	2.866	2.743	2.550	2.575	2.622	2.874	2.331	2.644	(0.52)
State	2.470	2.606	2.716	2.710	2.551	2.643	2.640	2.907	2.815	2.673	1.29

cows of different districts of Tamil Nadu was calculated for the period from 1998-1999 to 2006-2007 and the results are presented in Table 1. As could be understood from the table, the annual compound growth rate of milk productivity among crossbred cows of Tamil Nadu was at meager 0.54 per cent during the period between 1998- 1999 and 2006-2007. The average productivity was at 6.157 litres per day with range of 5.951 litres in 2000- 2001 to 6.298 litres in 2005-2006, which is slightly lesser than the Indian average of 6.440 litres (Blummel, 2010).

Among 29 districts studied, 10 districts of Tamil Nadu, viz, Chennai (3.73 per cent), Kanyakumari (0.45 per cent), Madurai (0.07 per cent), Namakkal (2.18 per cent), Ramanathapuram (1.53 per cent), Salem (1.37 per cent), Sivagangai (0.66 per cent), The Nilgiris (3.62 per cent), Thoothukudi (1.28 per cent) and Villupuram (3.04 per cent) Districts had registered negative annual compound growth rate at the rates mentioned in respective parentheses. Of those districts, that had a positive growth rate, Virudhunagar had a highest rate with 5.97 per cent, while Kanchipuram with a lowest rate of 0.20 per cent per annum. The average productivity of milk from crossbred cows varied from 5.463 litres in Tirunelveli

District to 7.421 litres in The Nilgiris District. The higher productivity at The Nilgiris could be due to the presence of larger number of Holstein-Friesian crossbreds among the population.

Productivity trends in desi cows: Milk productivity and productivity growth of desi and non-descript cows in different districts of Tamil Nadu were worked out for the period from 1998- 1999 to 2006-2007 and the results were presented in Table 2. As could be seen from the table, the average daily productivity of desi cows was 2.673 litres, which is better than the Indian average of 1.97 litres per day. The productivity of milk in desi cows had improved from 2.470 litres in 1998-1999 to 2.815 litres in 2006-2007 with an annual compound growth rate of 1.29 per cent. The positive growth in productivity could well be attributed to the balanced nutrition offered and improved animal husbandry practices followed. It is worth mention that the institutions offering production and health care services had also played a pivotal role in the augmentation of productivity.

Although the State's productivity growth was positive during the period, districts such as Chennai (0.87 per cent), Cuddalore (0.76 per cent), Dharmapuri (0.72 per cent), Dindigul (1.91 per cent), Karur (1.05

Table-3.: Productivity trends in Buffaloes

District	Productivity in litre (per day)										ACGR (%)
	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	Average	
Chennai	7.358	7.550	7.598	7.316	4.083	5.618	5.480	5.112	4.865	6.109	(6.05)
Coimbatore	5.694	5.746	5.673	5.370	4.901	4.606	3.714	4.164	4.148	4.891	(5.25)
Cuddalore	6.004	6.487	6.503	6.224	5.088	5.603	5.309	4.085	3.483	5.421	(6.57)
Dharmapuri	2.386	2.358	2.780	3.327	4.306	3.415	4.241	4.607	4.645	3.563	9.68
Dindigul	4.679	4.882	5.087	4.922	4.743	5.474	3.365	4.164	3.804	4.569	(3.32)
Erode	3.751	3.869	4.078	3.532	4.009	3.919	4.401	4.343	3.877	3.975	1.23
Kanchipuram	3.579	3.651	3.833	4.072	3.948	3.667	3.881	3.321	3.618	3.730	(0.53)
Kanyakumari	3.652	3.995	3.567	3.586	3.117	3.208	3.296	3.690	3.226	3.482	(1.66)
Karur	4.983	5.189	5.302	5.192	4.043	4.403	4.323	3.863	4.250	4.616	(3.43)
Madurai	4.596	4.631	4.759	4.692	4.048	4.611	4.188	4.669	4.195	4.488	(1.02)
Nagapattinam	3.546	3.550	3.731	4.105	3.939	4.000	3.941	4.467	4.165	3.938	2.39
Namakkal	2.226	2.320	2.449	2.768	3.383	3.252	3.698	4.979	4.299	3.264	10.35
Perambalur	4.677	4.825	5.001	4.551	4.573	4.058	3.915	4.230	4.452	4.476	(1.97)
Pudukkottai	2.792	3.044	3.484	3.735	3.220	3.122	4.401	4.588	4.717	3.678	6.21
Ramanathapuram	4.406	4.122	4.297	4.144	3.583	4.442	3.969	2.921	4.381	4.029	(1.89)
Salem	2.212	2.216	2.353	2.668	3.389	3.717	3.886	4.201	3.663	3.145	9.18
Sivagangai	2.395	2.553	2.891	3.191	3.405	3.025	4.001	4.677	3.274	3.268	6.30
Thanjavur	3.691	3.928	4.166	4.106	4.637	5.413	4.531	3.771	4.237	4.276	1.47
The Nilgiris	5.552	7.890	6.901	6.584	3.230	3.031	2.820	3.130	6.830	5.107	(7.25)
Theni	4.632	4.756	4.889	4.727	4.745	4.386	4.710	3.372	4.883	4.567	(1.60)
Thiruchirappalli	4.813	5.025	4.797	4.325	4.002	4.756	4.110	4.020	4.765	4.513	(1.53)
Thiruvallur	3.58	3.684	3.732	3.831	4.342	4.716	4.084	4.764	4.424	4.129	3.40
Thiruvannamalai	4.408	4.445	4.467	4.153	5.933	4.678	4.265	4.114	4.801	4.585	0.23
Thiruvarur	3.511	3.660	3.686	3.689	3.973	3.000	3.156	3.820	4.238	3.637	0.61
Thoothukudi	5.303	5.497	5.571	5.439	3.700	2.993	4.438	3.770	4.730	4.605	(4.31)
Tirunelveli	2.782	2.983	3.260	3.788	4.082	3.409	3.471	4.043	4.441	3.584	4.78
Vellore	3.474	3.538	3.794	3.747	4.030	4.539	4.575	4.110	5.753	4.173	5.19
Villupuram	4.881	4.463	4.561	4.444	4.433	5.013	3.451	2.909	4.328	4.276	(3.60)
Virudhunagar	3.779	3.961	4.579	4.431	4.386	3.802	4.692	3.270	3.747	4.072	(1.18)
State	4.115	4.304	4.407	4.368	4.113	4.134	4.080	4.040	4.353	4.213	(0.29)

per cent), The Nilgiris (0.66 per cent), Villupuram (1.11 per cent) and Virudhunagar (0.52 per cent) had registered negative annual growths at the rate mentioned in parentheses. Of the 20 districts that registered positive annual growth rate, Coimbatore tipped top with 4.93 % followed by Nagapattinam (4.35 %) and Thiruchirappalli Districts (3.76 %).

The average productivity of milk in desi cows in different districts of Tamil Nadu during the period from 1998-1999 to 2006-2007 ranged from 2.336 litres in Thanjavur District to 3.050 litres in Theni District. However, it is worth mention that the average productivity was more than 2.50 litres in all the districts, except Thanjavur and Thoothukudi Districts. Productivity trends in buffaloes: Milk productivity and productivity growth in buffaloes from all the districts of Tamil Nadu was worked out for the period from 1998-1999 to 2006-2007 and the results are depicted in Table 3. In contrast to both crossbred and desi cows, the annual compound growth rate of milk productivity of buffaloes in Tamil Nadu had declined at a rate of 0.29 per cent during the period under study. Although it appeared that the productivity had increased from end-to-end periods, the average productivity was at 4.213 litres, which ranged from

4.040 litres in 2005-2006 to 4.407 litres in 2000-2001. However, the productivity in buffaloes of Tamil Nadu was abysmally low vis-à-vis the nation's average productivity, which could be due to the fact that the state had lower number of high yielding buffaloes such as Murrah and Surti.

The slump in productivity could be attributed to increased urbanization which resulted in declined agricultural work force willing to take the buffaloes for grazing, as the buffaloes were mainly maintained with grazing along with supplementation of concentrates.

It needs special attention that 16 of the 29 districts in Tamil Nadu had recorded negative annual compound growth in buffalo milk productivity trend. They were Chennai (6.05 %), Coimbatore (5.25 %), Cuddalore (6.57%), Dindigul (3.32%), Kanchipuram (0.53%), Kanyakumari (1.66%), Karur (3.43%), Madurai (1.02%), Perambalur (1.97%), Ramanathapuram (1.89%), The Nilgiris (7.25%), Theni (1.60 %), Thiruchirappalli (1.53%), Thoothukudi (4.31%), Villupuram (3.60%) and Virudhunagar (1.18%) Districts. Of those districts that registered a positive annual compound growth rate, Nammakal tipped to top with 10.35 per cent, followed by Dharmapuri (9.68

Table-4.: Egg Productivity trends in Improved hens

District	Productivity in numbers							Average	ACGR (%)
	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005		
Chennai	70.567	70.810	70.821	71.196	70.849	215.246	153.131	103.231	17.64
Coimbatore	70.727	70.647	66.808	71.175	70.445	229.070	282.901	123.110	26.42
Cuddalore	70.888	70.486	70.608	70.308	70.822	214.025	174.605	105.963	19.25
Dharmapuri	70.160	70.851	71.174	71.426	70.973	225.519	247.014	118.160	24.29
Dindigul	71.011	70.729	70.567	70.499	70.429	221.739	204.025	111.286	21.49
Erode	70.850	71.174	71.296	71.497	70.935	231.964	310.269	128.284	27.44
Kanchipuram	70.325	70.892	71.255	71.498	70.857	218.618	189.757	109.029	20.51
Kanyakumari	70.769	70.768	70.769	70.550	70.720	210.444	169.704	104.818	18.71
Karur	70.526	70.566	70.809	70.938	70.613	224.470	210.93	112.693	22.13
Madurai	70.849	70.892	71.133	71.201	70.697	214.636	192.674	108.869	20.45
Nagapattinam	70.323	70.403	70.484	69.807	70.140	207.424	131.9	98.640	15.53
Namakkal	70.930	71.500	72.448	71.904	71.811	241.080	241.704	120.197	24.34
Perambalur	70.567	70.933	71.053	70.881	70.885	210.241	140.201	100.680	16.31
Pudukkottai	69.958	70.158	70.079	69.969	57.254	217.247	226.919	111.655	22.09
Ramanathapuram	70.527	70.567	70.688	70.764	70.350	212.357	98.952	94.886	12.17
Salem	70.772	70.851	71.092	71.478	74.884	224.505	297.562	125.878	26.88
Sivagangai	70.567	70.689	70.851	71.047	70.442	212.859	140.898	101.050	16.49
Thanjavur	70.932	70.608	70.648	70.677	70.832	212.243	268.097	119.148	24.75
The Nilgiris	70.019	70.608	70.887	70.052	69.146	197.857	116.000	94.938	13.52
Theni	70.972	70.647	70.809	70.901	70.674	212.929	201.612	109.792	21.00
Thiruchirappalli	70.687	70.728	70.891	71.002	68.003	209.924	264.155	117.913	24.29
Thiruvallur	70.604	71.095	70.729	71.007	70.590	216.598	215.391	112.288	22.02
Thiruvannamalai	70.646	71.257	71.459	71.338	70.908	213.888	132.277	100.253	15.65
Thiruvallur	71.053	70.647	70.689	70.502	70.747	215.607	136.917	100.880	16.18
Thoothukudi	70.523	70.892	70.932	70.621	70.764	216.148	183.585	107.638	19.97
Tirunelveli	70.565	70.811	71.012	70.856	70.852	217.759	165.277	105.305	18.69
Vellore	70.646	71.215	69.189	71.182	71.332	214.358	197.209	109.304	20.90
Villupuram	70.407	70.932	71.176	70.898	70.316	215.246	228.624	113.943	22.76
Virudhunagar	70.686	70.851	70.688	70.697	70.101	199.879	193.146	106.578	19.90
State	70.623	70.800	70.726	70.892	70.254	216.341	197.084	109.531	20.87

%) and Salem (9.18%) Districts, while the lowest positive was at Thiruvannamalai District with 0.23 %. The average annual milk productivity of buffaloes in different districts ranged from 3.145 litres in Salem District to 6.109 litres in Chennai, followed by 5.421 litres in Cuddalore Districts.

Productivity trends in 'improved hens': The egg productivity and its growth in improved hens of Tamil Nadu were calculated for the period between 1998-1999 and 2004-2005 (Table 4). As could be seen from the table, annual compound growth of egg productivity in improved hens of Tamil Nadu was 20.87 per cent. The average annual productivity was 109.531 eggs, which improved from 70.623 in 1998-1999 to 197.084 in 2004-2005. The productivity had increased remarkably from 2003-2004 onwards. The phenomenal improvement in the productivity could well be attributed to the introduction of new hybrid varieties of chicken, best managerial practices and balanced feeding.

Among the districts, Erode District had registered a highest annual compound growth rate in egg productivity with 27.44%, while Ramanathapuram District fetched the least productive trend at 12.17 per cent. It needs special mention that 16 of 29

districts had recorded annual compound growth rates of more than 20 per cent. The average productivity of improved hens in different districts over the period from 1998-1999 to 2004-2005 was ranging from 94.886 eggs in Ramanathapuram to 128.284 eggs in Erode Districts.

However, the Table clearly exhibited that the productivity had a phenomenal shift in all the districts from the year 2003-2004. The productivity in 2004-2005 had reached to 310.269 eggs in Erode District. The higher productivity rates in districts such as Coimbatore, Salem, Namakkal and Erode does not require reasoning, as they are the parts of poultry belt in India, especially South India.

Productivity trends in desi hens: Egg productivity and productivity growth of desi hens in various districts of Tamil Nadu were worked out and presented in Table 5. As evident from the table that the State's annual compound growth rate of desi hen egg productivity for the period between 1998-1999 and 2006-2007 was more than improved hens, with 21.382 %.

The average productivity for the above period was 57.576 eggs. However, coinciding with the productivity of improved hens, the productivity of desi hens also had a positive drift from the year 2003-2004.

Table-5.: Egg Productivity trends in Desi hens

District	Productivity in litre (per day)										ACGR (%)
	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	Average	
Chennai	28.918	29.200	29.200	29.479	29.294	90.997	88.972	85.167	88.419	55.516	20.196
Coimbatore	28.835	29.158	28.870	28.995	29.085	92.021	92.103	93.555	91.698	57.147	21.329
Cuddalore	29.036	29.241	28.606	29.195	29.034	91.995	90.854	90.387	92.620	56.774	21.095
Dharmapuri	28.999	29.120	29.643	29.770	29.567	92.191	91.869	90.343	91.884	57.043	20.930
Dindigul	29.037	29.282	29.198	29.306	29.280	91.651	91.942	100.630	93.288	58.179	21.746
Erode	29.040	29.159	29.207	29.319	29.362	93.330	92.549	104.521	96.819	59.256	22.367
Kanchipuram	29.038	29.038	28.825	29.402	29.447	92.360	92.364	93.026	90.637	57.126	21.166
Kanyakumari	29.159	29.159	29.402	29.807	29.522	91.778	91.722	92.683	91.915	57.239	21.049
Karur	28.714	29.404	29.807	29.685	29.399	92.712	92.884	85.312	93.796	56.857	20.809
Madurai	28.997	29.362	29.925	30.117	29.402	91.593	92.069	101.210	92.636	58.368	21.568
Nagapattinam	28.957	28.957	30.424	29.731	29.444	91.777	92.099	89.249	92.544	57.020	20.858
Namakkal	28.876	29.160	29.440	29.566	29.567	93.818	91.650	108.172	92.566	59.202	22.178
Perambalur	28.957	28.997	28.997	29.195	29.606	90.922	92.351	122.733	91.814	60.397	22.951
Pudukkottai	29.078	29.078	29.118	29.202	29.281	91.361	92.225	91.468	91.214	56.892	21.040
Ramanathapuram	28.796	28.997	30.176	29.926	29.114	89.824	90.284	89.917	92.477	56.612	20.830
Salem	28.876	29.322	29.968	29.161	29.200	93.199	91.727	100.018	96.898	58.708	21.983
Sivagangai	29.200	29.241	26.949	29.849	29.486	91.054	89.845	90.066	92.215	56.434	21.123
Thanjavur	29.078	29.362	28.759	28.799	29.241	92.334	92.033	97.378	93.460	57.827	21.649
The Nilgiris	28.836	29.240	28.458	29.256	28.896	93.455	89.610	89.287	92.648	56.632	21.072
Theni	28.958	29.159	28.869	29.841	29.367	91.993	92.489	87.208	92.462	56.705	20.894
Thiruchirappalli	28.956	29.200	28.499	29.973	29.644	91.857	92.736	93.947	90.315	57.236	21.198
Thiruvallur	28.955	29.281	29.643	29.576	29.078	92.190	92.321	94.978	90.595	57.402	21.130
Thiruvannamalai	29.038	29.241	29.362	29.318	29.609	91.990	92.518	98.376	92.072	57.947	21.520
Thiruvavur	29.078	29.160	28.752	28.872	29.118	91.600	92.266	91.378	91.029	56.806	21.082
Thoothukudi	28.877	29.403	29.523	29.565	29.402	90.973	91.571	102.553	90.156	58.003	21.510
Tirunelveli	28.957	29.241	29.337	30.011	29.848	92.210	91.640	92.229	91.507	57.220	21.024
Vellore	28.996	29.159	28.418	28.909	29.285	92.136	92.411	104.136	91.432	58.320	21.998
Villupuram	28.998	29.078	29.438	29.810	29.483	92.462	91.658	112.197	91.222	59.372	22.219
Virudhunagar	28.957	29.281	30.784	29.644	28.964	91.083	90.787	98.447	89.254	57.467	20.977
State	28.972	29.196	29.227	29.492	29.346	91.961	91.709	96.227	92.055	57.576	21.382

That is, until the year 2002-2003, the productivity was only less than 30 eggs, which afterwards rose to a level more than 90 eggs. This astounding growth in productivity could well be attributed to the improved feeding practices followed due to increased or premium rates paid for these eggs. Besides, the awareness on nutritional qualities of eggs and the health care consciousness among the rural population could have driven them to feed these hens sufficiently. In contrast to improved hens, desi hens in all the districts had registered an annual compound growth rate of more than 20 per cent, which could be construed as notable phenomena. Of the districts, Perambalur had a higher growth rate of 22.951 per cent, while Chennai had registered a low 20.196 per cent. The average productivity of desi hens in different districts was ranging from 55.516 eggs in Chennai to 60.397 eggs in Perambalur Districts. As quoted earlier, the productivity in all the districts tripled from 2003-2004 onwards.

#### Conclusion

The balanced nutrition offered and improved animal husbandry practices followed were the prime reasons for the positive growth in productivity of

cows. However, the low productivity in buffaloes could be due to the fact that the state had lower number of high yielding buffaloes such as Murrah and Surti. Further, the negative growth rate in productivity could be attributed to increased urbanization that resulted in declined agricultural work force willing to take the buffaloes for grazing, as the buffaloes were mainly maintained with grazing along with supplementation of concentrates. Introduction of new hybrid varieties of chicken, best managerial practices and balanced feeding resulted in the phenomenal improvement in the egg productivity of hens. Hence, simulation of increased productivity, better farm financing and improved milk marketing could result in enhanced livestock production that would meet the future demands.

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