A Comparative Growth Analysis in Dairy Farming between Uttar Pradesh and Lucknow District

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ABSTRACT

The main objectives of this study are to compare the growth of Milch animals and Milk Production in Uttar Pradesh and Lucknow District because Uttar Pradesh are the milk surplus states in India and Lucknow is one of the top district on the basis of milk procurement in Uttar Pradesh in 2017-18. Lucknow Plant with capacity of 3 lakh litre production that has expected cost Rs. 117.43 crore in which milk manufactured products is- packed milk powder, Paneer, Yogurt, Ghee and Khoya. Hence, Uttar Pradesh has considerable potential for generating additional employment through milk production. Study shows that the growth of milch animals has been statistically Change in Uttar Pradesh with 2% while the growth of milch animals has not been statistically Change in Lucknow District. On the other side, the growth of Milk Production has been statistically Change in UP with 4.3% as same as in Lucknow district.

Keywords- Dairy Farming, Milk Production, Milch Animals, Growth comparison, Lucknow, Uttar Pradesh, etc.

Introduction

At present India's dairy farming industry is growing at a fast rate and need a special and temporal analysis. Indian dairy sector contributes a large share in agricultural gross domestic products (GDP). Uttar Pradesh, Punjab, Haryana, Rajasthan, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu are the milk surplus states in India obviously the manufacturing of milk products is high in these milk surplus States.

In India, highest milk production in 2018-19 is of Uttar Pradesh (30,519) thousand tonne followed by Rajasthan (23668) thousand tonne. But highest growth rate is found in Bihar (129.88%) followed by Andhra Pradesh (79.38%) during 2001-02 to 2009-10 and Mizoram (136.36%) followed by Madhya Pradesh (122.00%) during 2009-10 to 2018-19[1].

Highest Per capita availability of milk in 2018-19 is of Punjab (1181 gm/day) followed by Haryana (1087 gm/day). Uttar Pradesh has 371 gm/day. But highest growth rate is found in Bihar (98.86%) followed by Andhra Pradesh (63.64%) during 2001-02 to 2009-10 and Mizoram (120.69%) followed by Madhya Pradesh (93.53%) during 2009-10 to 2018-19. Uttar Pradesh growth tare is 31.10% in the same period[2].

Top five districts on the basis of milk procurement in Uttar Pradesh in 2017-18 are Meerut, Lucknow, Moradabad, Faizabad and Bareilly. The National Dairy Plan has been introduced in eight districts of Uttar Pradesh namely-Meerut, Ambedkar nagar, Lucknow, Bijnore, Gonda, Farrukhabad, Barabanki and Faizabad. The plan is expected to encourage the State to introduce scientific measures to increase milk production. Lucknow Plant with capacity of 3 lakh litre production that has expected cost Rs. 117.43 crore in which milk manufactured products is- packed milk powder, Paneer, Yogurt, Ghee and Khoya.

Therefore, Significant investment opportunities exist for the manufacturing of value added milk products like milk powder, packaged milk, butter, ghee, cheese and ready to drink milk products in Uttar Pradesh. Livestock rearing is a very important source of employment in rural Uttar Pradesh. It has considerable potential for generating additional employment through milk production in this state.

At state level, **Pant, Sweta and et al. (2019)** highlight that Commercial dairy farming is playing a vital role in the economic development of the rural peoples throughout the country and more precisely in the hilly and mountainous states like Uttarakhand where land resources are very limited and options of livelihood are limited too. The growth and development of dairy farming mainly depends on the infrastructural conveniences provide to the dairy farmers with proficient rewards to the produced milk through dairy co-operatives, milk societies and milk collection centres. Dairy farming to a large extent relies on the level and pattern of livestock husbandry practiced as people keep various species of livestock for milk production. Socio-economic conditions, aspirations and awareness of the farmers are also important in running dairy business efficiently. Same as **Rathod, Prakashkumar And Dixit, Sreenath (2020)** focused that Dairying in Bundelkhand region continues to play a central role in providing livelihood security and coping mechanism to mitigate risks of the resource poor farmers. However, the development of this key sector has not progressed to the desired extent in comparison to other regions of Uttar Pradesh and also across other states. Further, it was found that this region of Uttar Pradesh is facing a tentative annual loss of 1,619 crores due to Anna Pratha. Hence, there is a need to focus on short and long term strategies based on strengths, weaknesses, opportunities, threats (SWOT) of dairy sector in Bundelkhand region.

The main objectives of this study are as follows:-

1. To focus on dairy farming in Uttar Pradesh and Lucknow District.
2. To compare the growth of Milch animals in Uttar Pradesh and Lucknow District.
3. To compare the growth of Milk Production in Uttar Pradesh and Lucknow District.

In order to test degree of achievability of the objectives of the study, following hypothesis are formulated which will be tested on the basis of secondary data.

Hypotheses:

1) H_0: *"There is no any difference between the growth of milch animals in Uttar Pradesh and Lucknow District."*

    H_1: *"There is statistically difference between the growth of Milch animals in Uttar Pradesh and Lucknow District"*

2) H_0: *"There is no any difference between the growth of Milk Production in Uttar Pradesh and Lucknow District."*

    H_1: *"There is statistically difference between the growth of Milk Production in Uttar Pradesh and Lucknow District"*

This paper is based on quantitative data that are collected from primary and secondary sources. Secondary data is collected from Dairying in Uttar Pradesh: A statistical Profile, 2017; Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture and Farmers Welfare, GoI. Residual tests, t-test and Anova tests are used for fitting model.
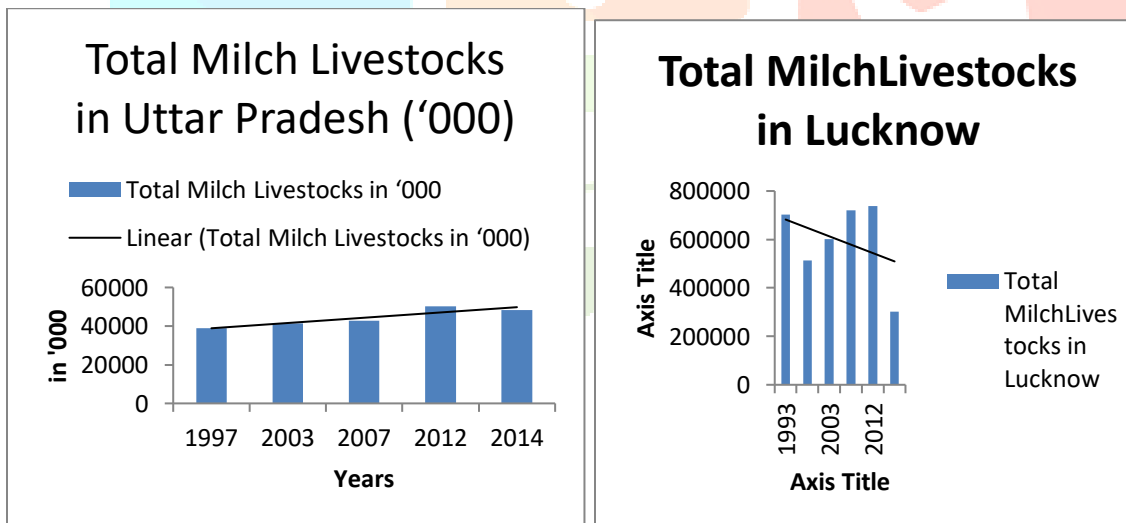
Growth of Milch Animals

At Uttar Pradesh level, Table-5.1 shows the average Milch Livestocks numbers for the last five times. From the table, Uttar Pradesh has 39.13 milch livestocks in 1997. It reaches at 48297 after increasing with approximate 5.1% growth rate in 2014. At Lucknow district level, Table-5.1 shows the average Milch Livestocks numbers for the last six times. From the table, Lucknow District has 701928 milch livestocks in 1993. It reaches at 300873 after decreasing with approximate 37% growth rate in 2014.

Table-5.1: Total Milch Livestocks

Year	Total Milch Livestocks@ in '000 in UP State	Total Milch Livestocks # in Lucknow District
1993	-	701928
1997	39013	512570
2003	41464	601025
2007	42695	720691
2012	50182	737534
2014*	48297	300873
Average	44330.2	595770.2
CGR	3.75	-37.5
AGR per five years	0.75	-7.5
AGR per year	0.15	-1.5

Source: Dairying in Uttar Pradesh: A statistical Profile, 2017, @ goats are excluded,*estimated value by directorate livestock department, UP, Lucknow; http://updes.up.nic.in/spideradmin/Hpage1.jsp, # goats are included *estimated value by directorate livestock department, UP, Lucknow

Average livestocks during this period is 44330.2 in Uttar Pradesh. It means average 1.0% livestock increases during five years or in other words only 0.2% has growth per year at Uttar Pradesh level. While in Lucknow District, average livestocks during this period is 595770.2. It means average 7.5% livestock decreases during five years or in other words only 1.5% has reverse growth per year at Lucknow level.

Fig-5.2: Total Milch Livestocks (in Thousand) with trend line

The model form of the growth of milch animals in Uttar Pradesh and Lucknow District is as follows-

$$lnMA_t^{UP} = +\beta_0 + \beta_1 T + v_t$$

$$lnMA_t^{LD} = +\gamma_0 + \gamma_1 T + \omega_t$$

Estimated growth model is as follows-

$$lnMA_t^{UP} = -18.53 + 0.015T + v_t$$

$$lnMA_t^{LD} = +43.77 - 0.015T + \omega_t$$

where, $lnMA_t^{UP}$ stands on log value of Indian Milch Animal at specific time period, T for Time , $lnMA_t^{LD}$ stands on log value of Lucknow District Milch Animal at specific time period, ω_t and v_t for residual.

The growth rate of milch animals is -0.015 or 2% in Uttar Pradesh during the year from 1997 to 2014. The growth rate of milch animals is -0.015 or 2% in Lucknow District during the year from 1993 to 2014. Statistical results are shown in the Table-5.3.

TABLE-5.3: RESULTS OF COEFFICIENT AND RELATED TEST

Variables	Coefficients	Test values for coefficients			Proportion of Variation	Test values for Model	
		S.E	t-Statistic	P Value	R^2	F-Statistic	P Value
For Uttar Pradesh							
T	0.014566	0.002871	5.073306	0.0148	0.90	25.738	0.015
INTERCEPT	-18.53386	5.761315	-3.216949	0.0487			
For Lucknow District							
T	-0.015	0.019224	-0.791926	0.4727	0.13	0.627	0.472
INTERCEPT	43.77	38.53128	1.135921	0.3194			

Source: It is estimated by researcher.

Coefficients and their t test results, R^2, f test (for goodness of fit) results shows that all are significant at 5% level of significance and 4 degree of freedom. The residuals are homoscedasticity and there is no correlation present in the residuals. Normality is tested through Jarque Bera test, serial correlation is tested Breusch-Godfrey Serial Correlation LM Test: and Homoscedasticity is tested through Glejser test.

About fitness of Model- The value of F-statistic is of the degree of freedom (1, 4) and 5% level of significance, is found 25.738. Its probability is 0.015 which is lesser than .05 that is the level of significance or the probability of rejection area. **Therefore, it represents that model belongs to goodness of fit in Uttar Pradesh while** The value of F-statistic is of the degree of freedom (1, 5) and 5% level of significance, is found 0.627. Its probability is 0.472 which is greater than .05 that is the level of significance or the probability of rejection area. **Therefore, it represents that model does not belong to goodness of fit.**

Proportion of Variation-The value of R^2 is 0.90, which show that independent variable cause 90% variation in the dependent variable only while at Lucnow district, The value of R^2 is 0.13, which show that independent variable cause 13% variation in the dependent variable only.

About Coefficients- The values of t-statistic is of the degree of freedom 4 and 5% level of significance, are found 5.07 (time coefficient) and -3.22 (intercept). Its probabilities are 0.02 and 0.05 respectively. p value of time coefficient is lesser than 0.05 while p value of intercept is 0.05 that is equal to 0.05. Value 0.05 is the level

of significance or the probability of rejection area. **Therefore, it represents that β_1 exists but β_0) does not exist. It means trend line pass out from the origin and the model will be-**

$$lnMA_t^{UP} = 0.015T + v_t$$

The values of t-statistic is of the degree of freedom 4 and 5% level of significance, are found -0.791926 (time coefficient) and 1.135921 (intercept). Its probabilities are 0.4727 and 0.3194 respectively. Both are greater than .05 that is the level of significance or the probability of acceptation area.

Therefore, it represents that both value of coefficients (γ_1 and γ_0) are not exist.

Result of the First Null Hypothesis is rejected and alternate hypothesis is accepted. Therefore there is statistically difference between growth of milch animal of Uttar Pradesh and Lucknow district.

Growth of Milk Production

At Uttar Pradesh state level, Table 5.4 shows milk production of Uttar Pradesh during 2001-02 to 2018-19. In 2001-02, milk production of UP was 14648 thousand tonnes. After increasing, it reaches at 30519 thousand tonnes in 2018-19 with 4.3% CAGR (compound annual growth rate) while AGR has fluctuating trend that can be seen in the fig 5.6. CAGR of milk production in uttar Pradesh is lesser than national level (5%). average of milk production in Uttar Pradesh is 21471 thousand tonnes during the same period. while At Lucknow district level, At Lucknow district state level, Table 5.10 shows milk production of Lucknow district during 2003-04 to 2019-20. In 2003-04, milk production of Lucknow district was 170 MT. After increasing, it reaches at 380 MT in 2019-20 with 4.34% CAGR (compound annual growth rate) while AGR has fluctuating trend that can be seen in the fig 5.5. Average milk production in Lucknow district is 258.75 during this period. Its growth is same as state level (4.3%) but lower than national level (5%).

Table-5.4: Production of Milk

Year	Milk Production '000 tonnes in UP	AGR	Per Capita Availibilty (gms/day)	AGR	Milk Production '000 tonnes in Lucknow District	AGR	Per Capita Availibilty (gms/day)	AGR
2001-02	14648		241					
2002-03	15288	4.37	245	1.66				
2003-04	15943	4.28	250	2.04	170		122	
2004-05	16512	3.57	254	1.60	176	3.53	123	0.82
2005-06	17356	5.11	262	3.15	210	19.32	144	17.07
2006-07	18094	4.25	267	1.91	219	4.29	147	2.08
2007-08	18861	4.24	274	2.62	229	4.57	150	2.04
2008-09	19537	3.58	278	1.46	239	4.37	153	2.00
2009-10	20203	3.41	283	1.80	247	3.35	154	0.65
2010-11	21031	4.10	289	2.12	257	4.05	157	1.95
2011-12	22556	7.25	310	7.27	250	-2.72	149	-5.10
2012-13	23330	3.43	312	0.65	257	2.80	150	0.67
2013-14	24194	3.70	318	1.92	266	3.50	152	1.33
2014-15	25198	4.15	326	2.52	278	4.51	155	1.97
2015-16	26387	4.72	335	2.76	292	4.92	162	4.64
2016-17	27770	5.24	348	3.88	301	3.09	165	1.50
2017-18	29052	4.62	359	3.16	310	2.99	167	1.48
2018-19	30519	5.05	371	3.34	319	2.91	170	1.46
Average	21471.05556	4.4163695	295.6667	2.579654	380	19.25	172	1.44
CAGR	4.3	0.8549462	2.33202	4.20413	258.7451	5.29	152.4347	2.25

Source : Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture and Farmers Welfare, GoI; NDDB,

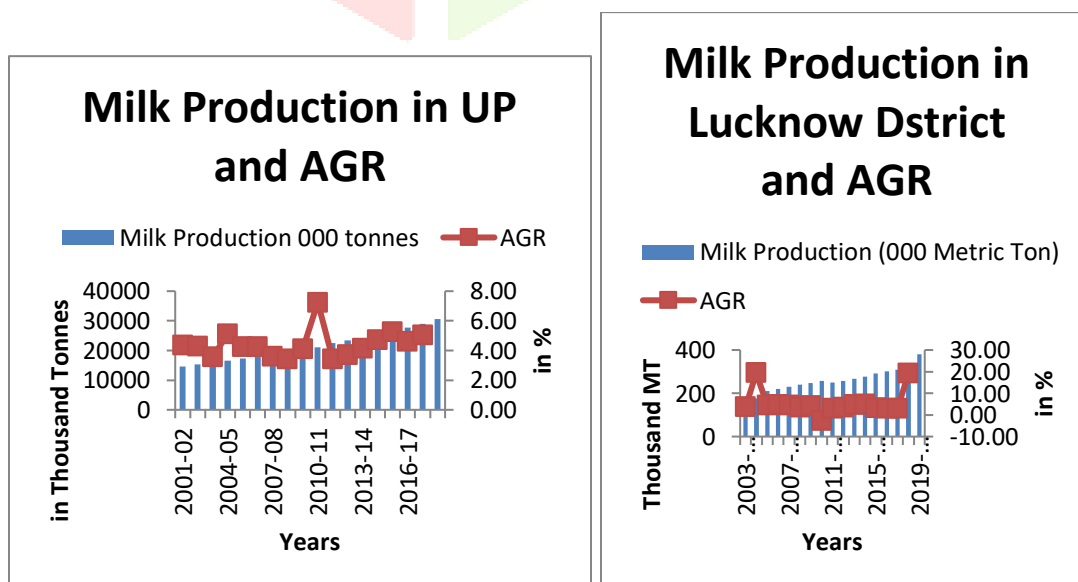Dairying in Uttar Pradesh: A Statistical Profile 2017, Red data is estimated by dragging

Fig-5.5: Production (Million Tonnes) and AGR of Milk

Per capita availability of milk in UP was 241 gms/day in 2001-02 that was reached at 371 gms/day in 2018-19 with 2.33% CAGR while its AGR fluctuates many times during this period. (Fig-5.5). It is less than national level i.e. 3.06%. average per capita availability in Uttar Pradesh is 295.67 which is greater than national level during this period. It is a good sign for Uttar Pradesh Uttar Pradesh State. While Per capita availability of milk in Lucknow district was 122 gms/day in 2003-04 that was reached at 172 gms/day in 2019-20 with 2.03% CAGR while its AGR fluctuates many times during this period. (Fig-5.5). Average per capita availability is lowest among all during this period. However, milch animal stocks are decreasing in Lucknow district while milk production is increasing therefore, It can be a taken as good sign for Lucknow District .
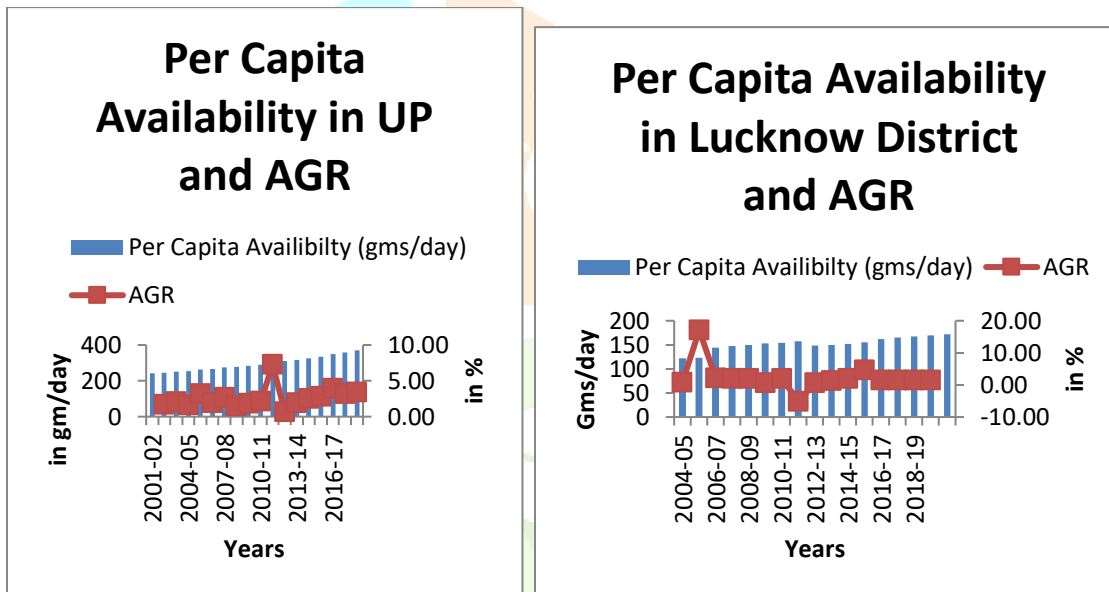

Fig-5.6: Per Capita Availability (gms/day) and AGR

The model form of the growth of Milk Production in Uttar Pradesh is as follows-

$$lnMP_t^{UP} = b_0 + b_1T + b_2MP_{t-1}^{UP} + \eta_t$$

$$lnMP_t^{LD} = c_0 + c_1T + c_2MP_{t-1}^{LD} + \phi_t$$

Estimated regression is as follows-

$$lnMP_t^{UP} = -76.13 + 0.043T + 0.40MP_{t-1}^{UP} + \eta_t$$

$$lnMP_t^{LD} = -81.84 + 0.043T + 0.59MP_{t-1}^{LD} + \phi_t$$

where $lnMP_t^{UP}$ stands on log value of UP Milk Production at specific time period, T for Time MP_{t-1}^{UP} for value of Indian Milk Production at previous time period $lnMP_t^{LD}$ stands on log value of Lucknow district Milk Production at specific time period, MP_{t-1}^{LD} for value of Lucknow district Milk Production at previous time period and ϕ_t, η_t for residual.

The growth rate of milk production is 0.043 or 4.3% in UP during the year from 2001-02 to 2019-20. While the growth rate of milk production is 0.043 or 4.3% in Lucknow district during the year from 2003-04 to 2019-20. Statistical results are shown in the Table 5.7.

TABLE-5.7: RESULTS OF COEFFICIENT AND RELATED TEST AT UTTAR PRADESH LEVEL

Coefficient Name	Value of Coefficient	S.E	Test values for coefficients		Proportion of Variation	Test values for Model	
			t-Statistic	P Value	R^2	F-Statistic	P Value
In Uttar Pradesh							
b_1	0.043	0.000	60.346	0.000	0.99	4357.875	0.000
b_0	-76.130	1.428	-53.318	0.000			
b_2	0.403	0.208	1.938	0.073			
In Lucknow District							
c_1	0.043429	0.004098	10.59697	0.043429	0.95	79.94200	0.000
c_0	-81.84342	8.242638	-9.929275	-81.84342			
c_2	0.589917	0.503566	1.171478	0.589917			

Source: It is estimated by researcher.

Coefficients and their t test results, R^2, f test (for goodness of fit) results shows that all are significant at 5% level of significance and 17 degree of freedom. The residuals are homoscedasticity and there is no correlation present in the residuals. Normality is tested through Jarque Bera test, serial correlation is tested Q-statistics and Homoscedasticity is tested through Glejser test.

About fitness of Model- The value of F-statistic is of the degree of freedom (1, 17) and 5% level of significance, is found 4357.875. Its probability is 0.00 which is less than .05 that is the level of significance or the probability of rejection area. Therefore, it represents that model belongs to goodness of fit in Uttar Pradesh. Same as Lucknow District.

The value of F-statistic is of the degree of freedom (1, 16) and 5% level of significance, is found 79.94. Its probability is 0.00 which is less than .05 that is the level of significance or the probability of rejection area. Therefore, it represents that model belongs to goodness of fit.

Proportion of Variation- The value of R^2 is 0.99 for Uttar Pradesh and R^2 is 0.95 for Lucknow District, which show that independent variable cause 99% and 95% respectively variation in the dependent variable.

About Coefficients- The values of t-statistic is of the degree of freedom 17 and 5% level of significance, are found 60.346 (time coefficient) and -53.318 (intercept). Its probabilities are 0.00 and 0.00 respectively. Both are less than .05 that is the level of significance or the probability of rejection area. Therefore, it represents that both value of coefficients (b_1 and b_0) are significant. while for Lucknow District, The values of t-statistic is of the degree of freedom 17 and 5% level of significance, are found 10.60 (time coefficient) and -9.93 (intercept). Its

probabilities are 0.04 and 81.84 respectively. p value of time coefficient is lesser than 0.05 while p value of intercept is greater than 0.05. Value 0.05 is the level of significance or the probability of rejection area.

Therefore, it represents that c_1 exists but c_0 does not exist. It means trend line passes out from the origin and the model will be-

$$lnMP_t^{LD} = 0.043T + 0.59MP_{t-1}^{LD} + \phi_t$$

A result of The Second Null Hypothesis is rejected and Alternative Hypothesis is accepted therefore there is significant difference between growth of milk production of Uttar Pradesh and Lucknow district.

Conclusion

Therefore, it can be concluded that *the growth of milch animals has been statistically Change in Uttar Pradesh with 2% while the growth of milch animals has not been statistically Change in Lucknow District.* The State has the highest number of adult female bovine population among all Indian States. Uttar Pradesh has over 24.5 million adult female cows and buffaloes. The State has the highest cattle population and highest buffalo population in the country. On the other hand, less information of livestock in Lucknow district due to unpublished 20th Uttar Pradesh livestock Census is the main cause of an inappropriate result. **On the other side, the growth of Milk Production has been statistically Change in Uttar Pradesh with 4.3% as same as in Lucknow district.**

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