

EFFECT OF AGRO-CLIMATIC ZONE ON THE DAIRY PRODUCTION IN ASSAM

Hemen Sarma¹, Dr. Jnanashree Borah² and Tirthankar Sarma³

¹Research Scholar, Department of Earth Science, University of Science & Technology, Meghalaya

²Professor, Department of Earth Science, University of Science & Technology, Meghalaya

³Research Scholar, Department of Geography, Rajiv Gandhi University, Arunachal Pradesh

ABSTRACT

Dairy production is an important source of livelihood in Assam for rural people and generates regular income to the farmer. Bovine family is a process to convert available feed and fodder material into milk and other byproducts. Agro-climatic zone in the study area is an extension of climate classification keeping in view the suitability to agriculture. Dairy farming can act as an instrument to enhance the income and livelihood of small and marginal land holders and it can act as an important subsidiary source of income. The aim of this paper is to study the status of bovine stock and production in Assam. Another objective of this study is to analyze the factors associated with the milk production in Assam using principal component analysis. Principal component analysis was used to study the factors which together impinge on the milk production in Assam. In the present study the agro-climatic and dairy related variables were considered to study effect of agro-climatic zone on the dairy production. Dairy farming in Assam is a part of integrated agricultural system where dairy and agriculture complement each other.

Effective planning and policy making for the development of dairy sector in a state could be brought about by studying the factors associated with milk production at macro level.

Keywords: Agro-climatic zone, Dairy cattle production and Assam

INTRODUCTION

Dairy production is one of the most important economic activities in the rural areas of Assam. Livestock rearing provides supplementary income for the most of the families in the study area. Dairy farming can act as an instrument to enhance the income and livelihood of small and marginal land holders and it can act as an important subsidiary source of income for rural people.

Animal husbandry and dairying activities along with agriculture continue to be an integral part of human life since the process of civilization started. These activities have contributed not only to the food basket and drought animal power but also by maintaining ecological balance. They play a significant role in generating gainful employment in the rural sector, particularly among the landless, small and marginal farmers and women, besides providing cheap and nutritious food to millions of people (NABARD, 2018). In most of the countries such as USSR, USA, Canada, New Zealand, Australia, India and North Western European Countries cows are mostly rearing for milk (Roy, 1997). India is blessed with vast dairy resource. Dairy farming involves a group of interaction of many factors that influence production and reproduction, environment and management. (Shahi, et.al 2012) Indian mythological stories reveal the age old relationship between livestock ranching and the rural economy (Roy. 1997).

Agro-climatic zone is a land unit in terms of major climates, suitable for a certain range of crop and cultivators. Considering climate, topography, soil, characteristics and the cropping pattern, the state of Assam is divided into six agro-climatic zones. These are - Lower Brahmaputra Valley, Central Brahmaputra Valley, North Bank Zone, Upper Brahmaputra Valley, Hill Zone and Barak Valley.

In Assam bovine population is very large but its productivity is low in comparison to other parts of the country. Bovine is an integral part of rural farming system in Assam. Bovine sector has immense contribution toward rural household economy, employment and nutritional security. In this paper an attempt is made to present the recent status of dairy production and relationship between agro-climatic zones with dairy production in Assam.

OBJECTIVES

Based on the background outlined above, the main objectives for the study are

- (i) To study the status of bovine stock and dairy production in Assam

(ii) To analyze the factors associated with the milk production in Assam .

STUDY AREA

Assam is a northeastern state of India, bordering with Bhutan and other northern states of the country known as Seven Sisters State. Assam is located near the Himalayas and has absolutely amazing natural view. It is bordered by the states of Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, as well as Bangladesh, Bhutan, and West Bengal. Assam covers an area of 78,438 km² (30,285 sq mi). Assam has a latitudinal extension of 24° N to 28° N and a longitudinal extension of 89°45' E to 96°00' E.

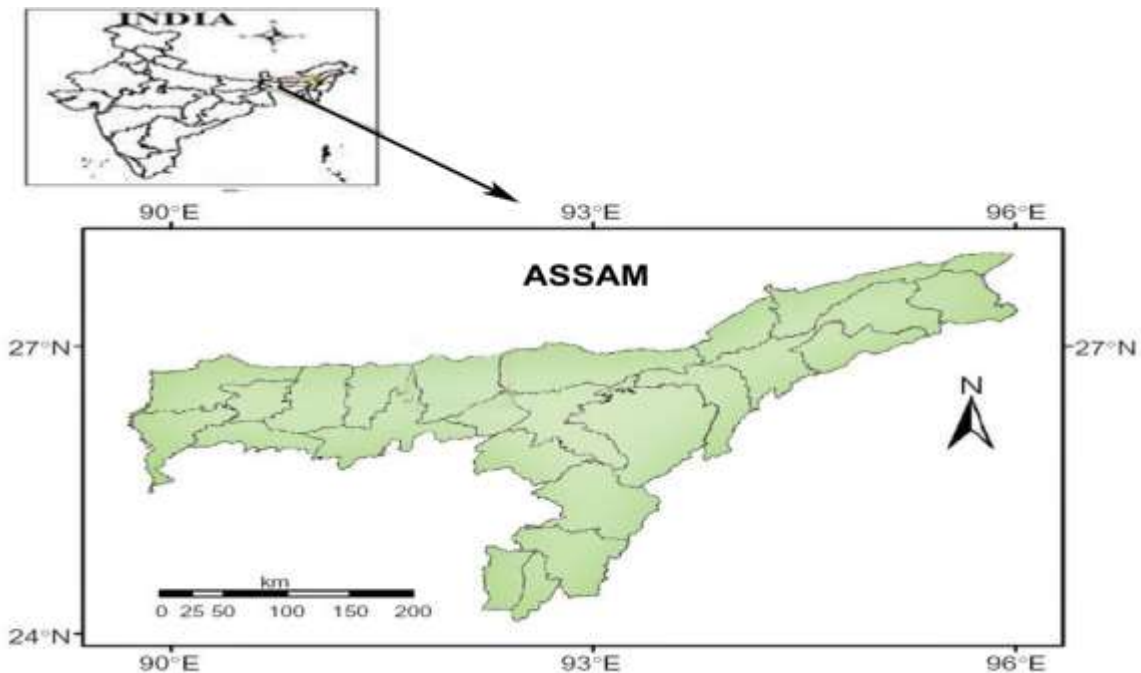


Figure 1: Location of Assam

METHODOLOGY

This study involving the status of dairy farming and bovine stock of Assam is based on secondary data collected from different offices like the Directorate of Economics and Statistics, Govt. of Assam Directorate of Veterinary Services, Livestock Census data of India etc. Data were compiled, tabulated and analysed with the help of descriptive statistics, figures, maps etc. whenever necessary. The multivariate analytical tool, principal component analysis was used to reduce the dimensionality of multivariate data. In this technique correlations and interactions among the variables are summarized in terms of a small number of underlying factors. The

method rapidly identifies key variables or groups of variables that control the system under study. Principal component analysis of a set of 'm' original variables generate 'm' principal components, PC1, PC2, PCm, with each principal component being a linear combination of Ss' scores on the original variable, *i.e.*

$$PC1 = b_{11} X_1 + b_{12} X_2 + \dots + b_{1m} X_m = X_{b1} ;$$

$$PC2 = b_{21} X_1 + b_{22} X_2 + \dots + b_{2m} X_m = X_{b2} ;$$

$$PC_m = b_{m1} X_1 + b_{m2} X_2 + \dots + b_{mm} X_m = X_{bm}$$

where,

b_i refer to the coefficients, $i = 1$ to m

x_i refer to the variables, $i = 1$ to m

The principal component analysis is employed to study the factors which together impinge on milk production. The Principle Component Analysis tools is used to reduce the dimensionality of multivariate data. In this technique correlations & interaction among the variables are summarized in terms of small numbers of factors.

RESULT AND DISCUSSION

Status of bovine stock and dairy production in Assam

Table 1 represented the agro – climatic zone wise bovine population and milk production in Assam as per 2019 livestock census. The table shows that the bovine population is highest in the districts of Sonitpur (1292412) and lowest in the districts of Dima Hasao (87346). On the other hand in the Lower Brahmaputra Valley zone where the no of bovine population is highest and in the hill zone it shows lowest bovine population. Table 1 shows the agro – climatic zone wise milk production of Assam in the year 2018 – 19. Nagaon districts produce highest milk 92.72 thousand liters and Dima Hasao districts produce less milk 7.67 thousand liters among the districts of Assam. On the other hand the Lower Brahmaputra Valley Zone has produced more milk 306.26 thousand liters and the hill produced less milk 52.11 thousand liters among the agro – climatic zones of Assam in 2018 – 19. In the report of Directorate of Animal Husbandry and Veterinary, Assam shows that after making all possible efforts by the Department for enhancement of livestock production, there is still exist a large gap between the requirement and availabilities of livestock production in the state.

Table 1: Agro – Climatic zone wise Bovine population in Assam as per 2018 – 19 Census

Sl. No	Agro Climatic Zone	District	Crossbred Cattle	Indigenou s Cattle	Buffalo	Goats	Total	Total Milk
1	Lower Brahmaput ra Valley	Dhubri	16511	481464	16975	191567	7065 17	34.03
2		Kokrajhar	6388	327203	7833	145530	4869 54	18.08
3		Bongaigao n	28243	228709	1240	107460	3656 52	24.42
4		Goalpara	9543	324078	8531	102978	4451 30	22.49
5		Kamrup	33427	466510	7076	191743	6987 56	46.14
6		Kamrup (M)	36305	83947	953	44614	1658 19	26.45
7		Borpeta	72846	409669	20629	177709	6808 53	59.86
8		Nalbari	31460	218751	5814	169294	4253 19	32.51
9		Baksa	16998	347108	813	179978	5448 97	28.32
10		Chirang	10246	197422	1745	62508	2719 21	13.96
To tal			261967	3084861	71609	1373381	4791 818	306. 26
11	Central Brahmaput ra Valley	Morigaon	28047	327432	4317	82247	4420 43	28.65
12		Nagaon	157241	767998	17525	240639	1183 403	92.72
To tal			185288	1095430	21842	322886	1625 446	121. 37
13	North Bank Zone	Darrang	21650	435866	37070	161879	6567 35	41.38
14		Sonitpur	48675	827591	20270	395894	1292 412	64.24
15		Lakhimpu r	15640	613388	11666	202071	8427 65	37.08
16		Dhemaji	1161	525819	16654	115091	6587	24.67

							25	
17		Udalguri	9082	374050	2717	131491	5173 40	20.95
To tal			96100	2776714	88377	1006426	3967 617	189. 32
18	Upper Brahmaput ra Valley	Golaghat	45881	565572	30549	198300	8403 02	58.1
19		Jorhat	21133	535024	27340	194140	7776 37	46.54
20		Sivsagar	9677	344972	15745	151529	5212 3	27.97
21		Dibrugarh	19087	321537	12533	202377	5555 34	24.66
22		Tinsukia	25108	357422	9747	154013	5462 90	26.99
To tal			120886	2124527	95914	900359	3241 686	184. 26
23	Hills Zone	Karbi Anglong	38773	335846	12711	408184	7955 14	44.44
24		Dima Hasao	8254	14322	34068	30702	8734 6	7.67
To tal			47027	350168	46779	438886	8828 60	52.1 1
25	Borak Valley	Karimganj	22412	256755	27530	80664	3873 61	33.81
26		Hailakand i	10587	121641	19215	53181	2064 24	16.37
27		Cachar	24685	330158	50447	139390	5446 80	42.58
To tal			57684	708554	97192	273235	1136 665	92.7 6
Gr an d To tal			765952	10140254	421713	4315173	1564 6092	946. 08

Source: 20th livestock census 2019, GOI

The per capita availability of milk for the year 2018 – 19 is estimated on the basis of total milk production and total population of the state for the period. As such the per capita of availability of milk is estimated to have become 73 gram per day which is much lower than the norms of 208 gram milk per day determine by ICMR (Table 2). Though the per capita availability of milk is very low yet there has been a steady growth of milk production in recent period.

Because it has seen that the estimated per capita consumption has remain almost same with continuous increase in npopulation.

Table 2: Share of milk production by cow, buffalo and goats in Assam from 2011 – 12 to 2018 – 19 (in million liters)

Year	Crossbreed Cattle	Indigenous Cattle	Buffalo	Goat	Total	Per Capita Available
2011 – 12	236.53	455.49	129.41	22.94	838.37	73
2012 – 13	247.07	450.42	128.72	16.68	844.90	72
2013 – 14	247.17	465.61	128.56	16.15	857.39	72
2014 – 15	246.06	246.03	123.05	25.66	872.98	72
2015 – 16	270.11	470.02	123.05	25.00	888.18	72
2016 – 17	-	-	-	-	904	72
2017 – 18	290.90	494.73	121.86	18.29	925.77	73
2018 – 19	298.31	505.78	124.02	17.81	945.92	73
% change 2018 – 19 over 2017 – 18	3%	2.2%	1.8%	-3%	2.2%	

Source: Economic Survey Assam 2015 – 16 to 2018 – 19

Table 3 represent the availability of milk in the state is 35.13% of the total requirement during the year 2018 – 19. This clearly shows that the state is still a deficit state in terms of milk production. The deficit is met by the supply of milk from outside the state specially from AMUL (Gujarat). (Kakaty, et.al 2017)

Table 3: Requirement and Availability of milk in Assam (in Million Liters)

Year	Requirement	Availability	Deficit
2011 – 12	2409	838 (34.79)	1571 (65.21)

2012 – 13	2450	845 (34.49)	1605 (65.51)
2013 – 14	2490	857 (34.42)	1633 (65.58)
2014 – 15	2531	873 (34.48)	1658 (65.51)
2015 – 16	2572	888 (34.53)	1684 (65.47)
2016 – 17	2612	904 (34.61)	1708 (65.39)
2017 – 18	2653	926 (34.90)	1727 (65.10)
2018 – 19	2693	946 (35.13)	1747 (64.87)

Note: Figure in bracket shows the availability and deficit of milk in percent to total requirement.

Source: Economic Survey Assam 2018 – 19 & Authors Compile

Factors associated with the milk production in Assam using principal compound analysis

Principal component analysis for milk production of Assam is given in Table 4. The table shows the component loadings and Eigen values for each component. The Eigen value for first four components is more than one. Milk production has positive relationship with total animal, temperature, rainfall, humidity and veterinary institution.

Table 4: Principal Component Analysis for milk production in the study area

Variables	1 LBVZ	2 CBVG	3 NBZ	4 UBVZ	5 HZ	6 BVZ
Milk Production	0.70	-0.38	0.02	0.24	0.54	0.26
Total Animal	0.39	0.79	0.28	-0.29	0.31	-0.21
Temperature	0.26	-0.19	-0.23	-0.39	-0.32	0.56
Rainfall	0.22	0.26	0.26	0.52	0.31	-0.23
Humidity	0.86	0.52	-0.41	0.21	0.63	0.21
Veterinary Institution	0.57	0.65	-0.08	0.76	0.32	0.73
Eigen Value	6.25	3.65	2.4	1.2	0.07	0.002

The result of the principal component analysis in milk production of Assam revealed that milk production has positive relation with total animal, temperature, rainfall etc. From this study it is clear that there are tremendous scope for dairy development in Assam.

CONCLUSION

For the above discussion it has observed that the dairy farming in Assam is traditional in nature, uneconomic in size and the breeds are mainly indigenous / non – descript with low productivity in comparison to national level. In the study of Baruah & Kar (2015) mentioned that there is an inverse relation between high humidity and quality of bovine stock as much as positive relation between quality of grassland and quality of cattle in the agro-climatic zone of Assam. But in the present study it is clear that milk production has a positive relation with temperature, rainfall, animals, humidity etc. at the agro-climatic zone of Assam.

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