

## RESEARCH ARTICLE



Received: 10.05.2018

Accepted: 26.7.2018

Published: 12.12.2018

**Citation:** Hiremath CP. (2018). A geographical study of livestock resources in Goa 1988-2016. *Geographical Analysis*. 7(2): 73-78. <https://doi.org/10.53989/bu.ga.v7i2.7>

**Funding:** None

**Competing Interests:** None

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Published By Bangalore University, Bengaluru, Karnataka

**ISSN**

Print: 2319-5371

Electronic: XXXX-XXXX

## A geographical study of livestock resources in Goa 1988-2016

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### Abstract

Livestock is one of the prominent resources, people soon realised the importance of livestock (animals) in their life and started to domesticate to fulfill the needs of multiple nature from the resource. The rearing of domesticated and semi domesticated animals has prominent expectations of direct and indirect nature viz dairy, farm activities, food, industry related products i.e. wool, fur, hair, feather etc. to extract and to satisfy the needs. This resource plays avital role in the lively hood of people in general and economic development of the people of a region/nation in particular. Moreover, the demand for protein derived from livestock products added more attention towards the resource in the world, which account for about two-thirds output in the developed as well as developing world apart from economic and cultural role in a region. The study area displays selectivelivestock resources and its distribution i.e. cattle, buffaloes, pigs, and other animals. One of the reasons was to explore spatial distribution and growth within the taluks. The presence of livestock in the state had noticed variation in bothfrom 1988 - 2016. The prevailing facts reveal that talukawise and year wise distribution of livestock in the state confined to interior taluks vizSattari, Sanguem, Canacona and Quepem. In these taluks rearing of livestock was meant for farm activities, later on the attention of the people leads to intensify the same to get gainful employment and to supplement the economic standard through milk, manure, and sale at the time of urgency. In course of time people found out the scope in dairy farming, market-based livestock rearing with the incentives by the government, and cooperation by the fellow people etc have led people of the rural settlements to explore the resource.

**Keywords:** Livestock; resource distribution spatial/temporal variation

### Introduction

Livestock combination of two words, "Live" "Stock" in other words domesticated animals. Livestock refers to any breed or population of animals kept by humans for useful commercial purpose. The rearing was focused on food stuffs, milk, meat, etc., plays an important role in healthier living and economic develop-

ment in general and rural households in particular. The importance goes beyond the mentioned food stuff, the organic manure, hides, skin, bones, fibre to the industrial sector have channelized the livestock rearing and supplementing family income, generating gainful employment in the rural sector particularly among the landless labours, marginal farmers in the taluks of the state.

## Objectives of the study

To know the composition and concentration of livestock resources in Goa. To find out periodic distribution of livestock resources in Goa 1988 to 2016. To understand the reasons for rearing in rural areas rather than towns in Goa.

## Data methodology

The required data had been obtained from various sources, Directorate of statistics government of Goa, Goa at a glance, Website (1988– 2016). The data obtained had been processed and simple mathematical tools i.e. percentage, employed for the said period 1988 to 2016. The obtained data had been categorized into various levels/categories i.e high moderate and low concentration of the resource. The study area has noticed variation in livestock resources distribution and growth, this change had been examined on the basis of statistical and empirical observations.

## Hypothesis

Livestock resource confined to a specific geographic space. Over the year's livestock resource has noticed changes in itself. People are selective to live stock farming in selected localities.

## Study area

Goa, small 25<sup>th</sup> coastal state lies between 14° 53'54''-15°40'00''N. Latitudes and 73°40'33''-74°20'13'' E longitude. The state share boundary with Maharashtra and Karnataka states, situated on Konkan region spreading over on area 3702 Sq. Km (1429SqMile) with two districts: North Goa district is 1736 Sq. Km and South Goa district 1966 Sq. Km. The length of 105 Km from north to south and width 60 Km west to east and the coastline consists of 118 Km. Due to the proximity to sea about 60 percent humidity throughout the year, and annual rainfall June – September varies 250 to 350 Cm rainfall and temperature of 20°C to 35°C. State comprises nearly 14,58,545 (2011) persons in which North Goa district shares nearly 8.18 Lakh against South Goa district 6.40 Lakh. Sex ratio (2011) 968 females per 1,000 males, which is above the national average of 960. The density of population 316 persons per Sq Km. Goa is the state with the highest proportion of urban population with 62.17 percent. Goa also has the lowest proportion of scheduled tribes at 0.04percent to the total population.

## Reasons for the study and limitations

Goa, has relatively high volume of livestock resource in spite of small geographical size made us to choose and known for selected types and varieties of livestock resources. Specially cattle, buffaloes, pigs, and other animals (excluding poultry)viz goats, sheep etc. from 1988 – 2016. The rearing of the animals was meant for products rather services in the farm activities. One of the reasons to rear of livestock was to sale, followed by meat, manure, and milk products, etc. The demand for the meat especially from the urban areas were encouraging people more of hinterland. The people of hinterland localities have an advantage to rear the animals and find needed logistical support. The farmers, land less labours, find an advantage for domesticating animals as a companion part and parcel activities of rural life. Easy availability of fodder, livestock shed (back yard) common knowledge and skill, availability of workers and matching allied activities, etc some of the factors to initiate livestock rearing in the study area.

## Spatial distribution of cattle resource

The study area poses sizable presence of cattle, its distribution in the taluks varies from 0.7 percent to 17.4 percent (Table no 1) such variation within 11 taluks reveal spatial inequality over a period of nearly three decades (28 years). Nearly 65 percent of the cattle confined to 30 percent of the taluks viz Sattari Canacona Sanguem and Pernem. Rest 35 percent of the taluks comprise 70 percent of the total cattle population. Over the decades these taluks continued to show high concentration. However, the growth remains constant over the years, largely due to new schemes, and accommodative policies of the state government.

## Spatial distribution of Buffaloes resource

The presence and distribution of buffaloes in the state was relatively low against cattle, pigs and other animals in the taluks over nearly three decades (1988-2016,Table no 2)may be viewed from various angles. Among the 11 taluks, Ponda (15.3 percent) Pernem(13.4 percent) and Bicholim (14.9 percent) together comprises nearly 50 percent of the total against Murmagao (3.2 percent, 0.6 percent) Tiswadi (3.4 percent). The changes may be observed from 2000- 2014,where in consistency could be scene in the spatial and periodic distribution of buffaloes in the state in spite of less share in the livestock resources.

**Table 1.** Spatial distribution of the Cattles (in percent) from 1988-2016.

Year	Taluka												Total
	Tiswadi	Bardez	Pernem	Bicholim	Sattari	Ponda	Sanguem	Dharbandora	Canacona	Quepem	Salcete	Mormugao	
1988	3.0	8.6	12.8	9	11.8	11	11.8		10.5	11.2	8.3	2	99.5
1989	3.5	9.9	12	8.4	11.2	9.9	11.4		10	10.5	10.8	1.9	99.5
1990													0.0
1991	3.5	9.9	12	8.4	11.2	9.9	11.4		10	10	10.8	1.9	99.0
1992	3.5	9.9	12	8.4	11.2	9.9	11.4		10	10	10.8	1.9	99.0
1993	3	9.3	11.1	9.9	10.8	9.7	10.1		12	12	9.4	2.2	99.5
1994													0.0
1995	3.2	9.9	11.1	9.2	10.8	9.7	9.8		12.4	12.4	9.3	2.2	100.
1996	3.2	9.9	11.1	9.2	10.8	9.7	9.3		12.4	12.4	9.3	2.2	99.5
1997	3.2	9.9	10.9	9.2	10.8	9.7	9.6		12.4	12.4	9.3	2.2	99.6
1998	3.2	9.9	11.1	9.2	10.8	9.7	9.8		12.4	12.4	9.3	2.2	100
1999	3.2	9.9	11.1	9.2	10.8	9.7	9.8		12.4	12.4	9.3	2.2	100.
2000	3.2	9.9	11.1	9.2	10.8	9.7	9.8		12.4	12.4	9.3	2.2	100
2001	3	10.2	12.1	8.1	11.6	8.7	14.1		11.2	12.4	6.7	1.1	99.2
2002	3	10.2	12.1	8.1	11.6	8.7	14.1		11.2	12.4	6.7	1.1	99.2
2003	2.7	8.1	11.8	9.2	13.8	8.8	12		13.2	13.2	6.3	1.3	100
2004	2.8	8.2	11.7	9.2	13.9	9.1	12		13	13	6.2	1.4	100
2005	2.8	8.2	11.7	9.2	13.1	9.1	12.5		13	13	6.2	1.5	100
2006	2.8	8.2	11.7	9.2	13.1	9.1	12.5		13	13	6.2	1.5	100.
2007	2.8	8.2	11.7	9.2	13.1	9.1	12.5		13	13	6.2	1.5	100.
2008	1.8	7.7	9.6	7.6	17.1	8.5	10.8		14	14	8.7	0.7	100.
2009	1.8	7.7	9.6	7.3	17.1	8.5	10.9		14	14	8.8	0.7	100.
2010	1.8	7.3	9.6	7.1	17	11	10.8		13	13	8.7	0.7	100.
2011	1.9	7.5	9.5	7.3	17.4	8.7	11.1		13.6	13.6	8.9	0.7	100.
2012	1.9	7.5	9.5	7.3	17.4	8.7	11.1		13.6	13.6	8.9	0.7	100.
2013	4	6	8.5	9	14.7	9	5.3	4.8	13	13.6	11.5	0.8	100.
2014	4	6.1	8.7	9	14.5	8.8	5.3	4.7	13	13.6	11.3	0.8	99.8
2015	4	6.1	8.7	9	14.5	8.8	5.3	4.7	13	13.6	11.3	0.8	99.8
2016	4	6.1	8.7	9	14.5	8.8	5.3	4.7	13	13.6	11.3	0.8	99.8

The taluks of Sattari, Sanguem, Canacona and Quepem have more than (14.5 percent) each against Tiswadi (1.8 percent), Marmugao (2.2 percent) taluks over the period 1988-2016 in the state.

The taluk as lowest distribution of buffaloes are Marmugao and Canacona. constitute less than the taluks of Ponda, pernem and Salcete.

### Spatial distribution of Pigs resource

The Table no 3 indicates taluka wise distribution of pigs from 1988-2016 nearly over three decades. The rearing of pigs indicates its confinement to the taluks of Salcete (50 percent) followed by Tiswadi and Bardez, together constitutes nearly 75 percent of the states total, Where as the taluks of Bicholim Ponda had less than 1 percent of the total in the state.

Over the decades Salcete (55.5 percent, 1988) Tiswadi (25 percent) and Bardez (12 percent) taluks continued to retain the position against the taluks Sattari (0.14 percent) Bicholim (0.13 percent). However, taluks of Sattari, Ponda, Sanguem, Dharbandora comprise less against rest of the taluks. The taluks of Sattari, sanguem and bicholim continued to have less (0 percent– 2 percent) percentage over the years.

### Spatial distribution of other animals resource

The spatial distribution of other animals in the state (Table no 4) display distinct pattern over the period 1988 – 1992. In many taluks other animals viz sheep's goats could be seen in between Salcete (19 percent)–Sattari (4 percent) more so in coastal taluks. However, from 1988 – 2003 spatial distribution of other animals was by and large uniform with an exception of Tiswadi Bardez and Salcete taluks together



**Table 2.** Spatial distribution of the Buffaloes (in percent ) from 1988-2016

YEAR	TALUKA												Total
	Tiswadi	Bardez	Pernem	Bicholim	Sattari	Ponda	Sanguem	Dharbandor	Canacona	Quepem	Salcete	Mormugao	
1988	6.8	8.6	13.2	11.8	10	15.3	9.1		3.8	6.8	10.9	3.2	99.5
1989	4.9	9.3	12.4	11.2	9.4	14.4	8.9		3.8	6.3	15.9	3	99.5
1990													
1991	6.1	9.2	12.2	11.1	9.2	14.3	8.8		3.7	6.2	15.7	2.9	99.4
1992	6.1	9.2	12.2	11.1	9.2	14.3	8.8		3.7	6.2	15.7	2.9	99.4
1993	5.6	7.8	11.5	10.9	17.8	12.4	8.4		4.2	5.5	12.2	3.1	99.4
1994													
1995	6.8	9.1	12.7	11.5	8.41	13.5	9.3		5.1	6.1	13.5	3.5	99.5
1996	6.7	9.2	12.7	11.5	8.3	13.1	9.5		5.3	6.1	13.5	3.5	99.4
1997	6.7	9	12.5	11.3	8.3	13.3	9.1		5	6	14.7	3.4	99.3
1998	6.8	9.1	12.7	11.5	8.4	13.5	9.2		5.3	6.1	13.5	3.5	99.6
1999	6.7	9	12.7	11.5	8.3	13.5	9.2		5.3	6.1	13.4	3.5	99.2
2000	6.8	9.1	12.7	11.5	8.4	13.4	9.2		5.1	6.1	13.5	3.5	99.3
2001	5.8	10.1	13.5	10.9	9.1	11.9	12.8		3.6	6.4	12.1	3.1	99.3
2002	5.8	10.1	13.5	10.9	9.1	11.9	12.8		3.6	6.4	12.1	3.1	99.3
2003	5.8	8.7	13.5	14.1	9.4	14.1	11.3		3.6	8.2	9.8	1.1	99.6
2004	5.8	8.6	13.4	14.1	9.4	14.1	11.2		3.6	8.2	9.6	1.1	99.1
2005	5.8	8.6	13.4	14.1	9.4	14.1	11.2		3.6	8.2	9.6	1.1	99.1
2006	5.8	8.6	13.4	14.1	9.4	14.1	11.2		3.6	8.2	9.6	1.1	99.1
2007	5.8	8.6	13.4	14.1	9.4	14.1	11.2		3.6	8.2	9.6	1.1	99.1
2008	3.6	8.6	10.5	12.4	12	12.8	10.6		3.6	7.6	16.7	0.7	99.1
2009	3.4	8.6	10.5	12.4	12	12.7	10.6		5.3	7.6	16.2	0.7	100
2010	3.5	8.8	9.8	12.5	11.3	12.8	10.9		5.4	7.8	16.7	0.5	100
2011	3.5	9	10	12.5	11.5	13	11.2		5.5	7.8	14.5	0.5	99.0
2012	3.5	9	10	12.5	11.5	13	11.2		5.5	7.8	14.5	0.5	99.0
2013	12	7.3	10.8	12.9	8	9.9	3.4	5.1	5.5	7.3	17.2	0.6	100
2014	6	7.8	11.6	14	8	11.3	4	5.5	4	7.8	18.5	0.6	99.1
2015	6	7.7	11.6	14	8.8	11.4	3.5	5.6	4	7.9	18.5	0.6	99.6
2016	6	7.7	11.6	14	8.8	11.4	3.5	5.6	4	7.9	18.5	0.6	99.6

comprise more than 55 percent of the state, against the rest. This kind of concentration need to be seen in the light of multiple factors i.e. transport connectivity, ready market, usage for commercial purposes, customised facilities etc support in favour of other animals among the prominent types of livestock resource in the state.

The Table no 4 reveal uneven distribution in the state Salcete (34 percent) Bicholim (20 percent) and Bardez (16.9 percent) than the rest. In these the rearing of the animals remains preferred activity with the help of the various types of the scheme and the incentives and active participation of the people.

## Summary

The spatial distribution of cattle, buffaloes, pigs, and other animals in the taluks of the state 1988-2016 display variation. some taluks Sattari, Sanguem, Canacona contain extreme figures against others taluks. The distribution of cattle, buffaloes reveals similar pattern than the spatial distribution of pigs, which has well demarcated/concentric area and other animals in the study area has pockets of natural and logistical services-based taluks. Some taluks together constitute around 3/4<sup>th</sup> of the total livestock resource in the state. The overall observation reveals that state was experiencing the traditional practices of livestock rearing in the confined localities and continued to do so. The taluka wise distribution of pigs sees the highest in Salcete 55 percent and lowest in Bicholim, Ponda nearly 1 percent. The distribution of other animals reflects the meagre composition to the total

**Table 3.** Spatial distribution of the pigs (in percent) from 1988-2016

Year	Taluka											
	Tiswadi	Bardez	Pernem	Bicholim	Sattari	Ponda	Sanguem	Dharbana	Canacona	Quepem	Salcete	Mormugao
1988	16.1	12.1	5.1	0.29	0.14	5.1	4.1		5.1	5	40	7
1989	13.5	12.5	4.5	0.23	0.1	4.1	3.2		4.4	4.3	47.1	6
1990												
1991	13	12	4.5	0.23	0.1	4.3	4.1		4.3	4.3	47.1	6
1992	13	12	4.5	0.23	0.8	4.3	4.1		4.3	4.3	46.4	6
1993	12.6	14.2	3.6	0.21	0.09	3.4	4.1		6.3	4.1	44.1	7.1
1994												
1995	13.1	14.1	3.2	0.13	0.09	3.4	4		6.3	4.2	43.5	8.2
1996	13.1	14	3.2	0.13	0.09	3.4	4		6.3	4.2	43.5	8.2
1997	13.1	14.1	3.2	0.13	0.09	3.4	4		6.3	4.2	43.5	8.2
1998	18	24.5	6	0.24	0.16	5.7	5.9		6.3	10.5	7.9	14.8
1999	13.7	11.6	3.6	0.13	0.09	3.4	4		6.7	4.7	44.9	8.2
2000	13.7	11.5	3.6	0.13	0.09	3.4	4		6.3	4.7	44.3	8.2
2001	13.2	11.3	3.6	0.13	0.05	3.6	4.3		6.3	5.7	44.9	6.7
2002	13.2	12.4	3.6	0.13	0.05	3	4.3		3.6	6.7	45.6	6.7
2003	14.8	8.7	4.7	0.09	0.11	4.2	3.7		3.6	5.6	46.1	7.9
2004	27.5	15.2	8.1	0.15	0.19	7.6	6.4		5.7	9.8	7.5	11
2005	13.2	8.7	4.6	0.09	0.11	4.3	3.6		5.5	5.5	46.4	7.9
2006	13.2	8.7	4.6	0.09	0.11	4.3	3.6		5.6	5.5	46.4	7.9
2007	13.2	8.7	4.6	0.09	0.11	4.3	3.6		5.6	5.5	46.4	7.9
2008	8.3	8.3	2.4	0.09	0.04	3.8	6.7		6.4	6.1	50.1	7.4
2009	8.1	8.4	2.4	0.09	0.04	3.6	6.7		6.4	6.1	50.2	7.4
2010	7.6	7.7	2.4	0.24	0.03	3.9	2.8		6	5.5	50.3	13.2
2011	7.6	7.7	2.4	0.24	0.03	3.9	6.1		6	5.6	52.6	7
2012	7.6	7.7	2.4	0.24	0.03	3.9	6.1		6	5.6	52.6	7
2013	7.1	4	2.3	0.3	0.05	5.5	3.1	0.27	10	6.1	55.1	6
2014	7.1	4	2.3	0.3	0.05	5.5	3.1	0.27	10	6.1	55.1	6
2015	7.1	4	2.3	0.3	0.05	5.5	3.1	0.27	10	6.1	55.1	6
2016	7.1	4	2.3	0.3	0.05	5.5	3.1	0.27	10	6.1	55.1	6

livestock resources in the state. Sattari (4 percent) Salcete (19 percent) taluks in the state.

The inconsistency in its spatial distribution in the state was mainly due to invisible factors ie consistent support of market, financial assistance, logistical support, transport connectivity etc. In some of the taluk's government schemes, incentives, subsidies and one-time assistance etc were some of the encouraging steps to have uniform distribution of livestock resource in the state.

## Conclusion

Spatial distribution of the livestock resources in the study area display contrast picture among the taluks, more so within the types of the livestock resources, viz Cattle,

buffalos, pigs and other animals over the decades. In each taluk above stated livestock resource 's present but the pattern of spatial distribution differs in year wise and volume. The diverse composition in the study area was that some taluks were known for the specific, large volume of livestock, ie pigs (Salcete Bardez) cattle (Sattari Bicholim) other animals (TiswadiQuepem) invariably dominate. The empirical observations in these taluks reveal that in some taluks the usage of the livestock product linked with the religious beliefs or selected communities. A strong belief or bondage could be seen in the study area for such presence.

The food stuff of specified livestock resource and the concentration of people with religious belief needs to explored further. The facts to believe Table 1, 2, 3 invariably makes one to compare with concentration of population.



**Table 4.** Spatial distribution of the other animals (in percent) from 1988-2016

YEARS	TALUKA												
	Tiswadi	Bardez	Pernem	Bicholim	Sattari	Ponda	Sanguem	Dharbandor	Canacona	Quepem	Salcete	Mormugao	Total
1988	11.0	16.9	9.4	6.8	4.2	7.8	6.8		5.6	5	19.1	7	99.6
1989	10.1	18.5	9.2	6.2	3.7	6.9	6.7		4.8	4.6	22.4	6.4	99.5
1990													
1991	10.6	19.9	9.7	6.5	3.9	7.2	7		0	4.8	23.6	6.7	99.9
1992	10.1	18.5	9.2	6.2	3.7	6.9	6.7		4.8	4.6	22.4	6.4	99.5
1993	6.7	11.4	4.3	3.2	2.2	44.3	0		6.7	2.4	15	3.4	99.6
1994													
1995	12.3	20.7	7.6	5.2	4	7.7	6.9		5.2	5.1	18.1	6.7	99.5
1996	11.6	19.5	7.1	4.9	3.8	7.2	6.5		4.9	4	23.6	6.3	99.4
1997	11.6	19.4	7.1	4.9	3.8	7.2	6.5		4.6	4.7	23.5	6.3	99.6
1998	11.5	19.3	7.1	4.8	3.9	6.9	6.5		4.9	4.7	23.4	6.3	99.3
1999	11.9	19.8	7.3	5	3.8	7.4	6.6		5	4.9	21.4	6.4	99.5
2000	11.6	19.5	7.3	5	3.1	7.2	6.5		4.9	4	23.6	6.3	99.0
2001	11.7	19.7	6.7	5.2	3.1	7.2	6.4		3.9	5.5	24.3	6.1	99.8
2002	11.7	19.7	6.7	5.2	3.2	7.2	6.4		3.9	5.5	24.3	6.1	99.9
2003	10.1	15.4	7.2	5.2	1.5	9.2	7.1		5	7.6	24.6	6.3	99.2
2004	1.3	3.3	3.6	2	0	2.5	1.1		1.7	3	80	0.7	99.2
2005	1.1	8.2	0	23.5	0	29.4	0		1.1	2.3	34.1	0	99.7
2006	1.1	8.2	0	23.5	0	29.4	0		1.1	2.3	34.1	0	99.7
2007	1.1	8.2	0	23.5	0	29.4	0		1.1	2.3	34.1	0	99.7
2008	9.5	9.5	4.7	0	0	0	4.7		28.5	38	4.7	0	99.6
2009	0	0	0	0	0	0	0		0	0	0	0	0.0
2010	0	9.1	6.5	4.9	9.8	5.1	12.2		6.3	7.5	35.9	2.2	99.5
2011	0.7	0	0	3.6	0	84.6	0		4.3	5.8	0.7	0	99.7
2012	0.7	0	0	3.6	0	84.6	0		4.3	5.8	0.7	0	99.7
2013	2.5	5.1	0	0	0	12.8	15.3	23	7.6	15.3	17.9	0	99.5
2014	2.5	5.1	0	0	0	12.8	15.3	23	7.6	15.3	17.9	0	99.5
2015	2.5	5.1	0	0	0	12.8	15.3	23	7.6	15.3	17.9	0	99.5
2016	2.5	5.1	0	0	0	12.8	15.3	23	7.6	15.3	17.9	0	99.5

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