CHAPTER 1

GENERAL INTRODUCTION

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1.1 Introduction

The state Assam is situated in the North-East region of India, with a geographical area of 78,438 square kilometers. It represents immense diversity with ethnic, linguistic community and even religious differentiation within the region. The position of Assam is 8905/-960 1/ east longitude and 2403/-27058/ north latitude. Assam is surrounded by the states Arunachal Pradesh, Nagaland, Manipur, Mizoram,Meghalaya and west Bengal with international boundaries of Bangladesh and Bhutan. The northern part of Assam is occupied by the elongated basin of the river Brahmaputra. Most of Assam's population lives in this basin. In the central part of Assam, to the south of the hills is the Barak Valley. The state has 27[1]districts including Kamrup (Rural and Metro) and four districts under the Bodoland Territorial Autonomous Districts (BTAD). As per the government census report of 2011, the total population in Assam is 31.2millions. Population density of Assam is calculated as 397 per sq.km. which is little high as compared to national figureof 382 per sq.km.[21, 22]. The state Assam represents enormous diversity. There is an issue of the demographic changes that have taken place, in particular in this century [28].

In general, Demography is the scientific study of characteristics and dynamics pertaining to the human population. According to Peter R. Cox, "Demography is the study of statistical methods of human population involving primarily the measurement of the size, growth and diminution of the numbers of the people, the proportions of living being born or dying within the same area or region and the related functions of fertility, mortality and marriage." The characteristics covered by this study include size, growth rate, density and distribution of a specific population. Demography requires the study of specific information that may be gathered from a population census or vital statistics records. Demography must know both how to scientifically obtain information and how to interpret it relatively. It is widely used for various purposes and can encompass small, targeted population or mass population. In real estate, demography is employed to give clients an overview

[1] At the time of government census 2011, there were 27 districts in Assam

of specific neighborhoods statistical concepts essential to demography include birth and death rate, infant mortality rate, fertility rate and life expectancy. These concepts can be further broken down into more specific data, such as the ratio of men to women and the life expectancy of each gender. A census helps to provide much of this information in addition to vital statistics records. In some studies, the demography of an area is expanded to include education, income, race or ethnicity and religion. The information gathered and studied for a demographic overview of a population depends on the parity of utilizing the information.

The central events are all those which may occurs to an individual during his life time such as birth, death, marriage, separation, sickness, adoption etc.With the help of these events the health and growth of a community can be studied. Vital statistics refers to the data or the techniques applied for the analysis of vital events occurring in a community. Demography is also used to study the both quantitative and qualitative aspects of human population. The quantitative study of human population includes events such as birth, sex, age, caste, literacy, worker, income, marital status and fecundity, migration, death etc. [35, 40]. Qualitative aspects are the sociological factors such as quality of education, crime development, diet and nutrition, race, social class, wealth well-being etc.

Theoretical and empirical overview of major issues and the methodological approaches in the demographic study of human fertility in developing and developed countries explores advanced sources of demographic data. The methods of analysis used to analyze the levels and changes in these processes used in applied settings. When a country undertakes demographic analysis then she knows the population of the country and then government knows how to distribute the resources equitably among the provinces. Demography also describes human population in all the variables including age, sex, distribution in space and other characteristic features in relation to disease and other factors.

1.2 Fertility and Demography

The term ‘fertility’ is one of the significant parts in demography. In demography, it refers to the actual production of children. In the measurement of population growth, fertility plays a major role. It is a concept which is primarily concerned with the number of live births. Fertility is a result of fecundity and the physiological capacity to reproduce. Human fertility depends on factors like nutrition, sexual behavior, culture, instinct, endocrinology, timing, economic way of life and emotions.

The level of fertility in the world varies mostly by country and culture, social and economic conditions, as well as by individual characteristics such as age. Generally, more industrialized and economically developed societies have lower fertility than less developed societies. Also, within countries, generally, more educated groups with higher income have lower fertility than less educated groups with lower income. Historically, as groups within countries have improved their living standard, it also led to economic development and better health conditions resulting in the decline of the rate of morbidity and mortality. In such societies, fertility rates also trend to decline due to induced abortion [9, 10]. This sequence of events has been observed in western industrialized societies over the last two centuries and in developing regions in the last half century. The process is often referred to as the demographic transition and it forms the principal theoretical base for research conducted by demographers. This type of study also analyzes mortality and fertility of national and regional population.

It is worthwhile to mention that socio-demographic scenario of Assam is diversified. The population growth rate of Assam has been most alarming and it demands an extensive research works in this field. Moreover as fertility and growth rate is closely related, the role of fertility transition in the population growth rate is significant in this context.

1.3 Population and Growth Trend of India and Assam

The World population stood at 1,600 million at the beginning of 20th century. By that time the population of India was 240million which was about 15 percent of the total population of the world. At the end of last century, India's population stood at a little over 1,000 million against the World total of 6,055 million. The average growth rate in India in the last decade of last century was 1.93 percent whereas the growth rate for the world average was 1.4 percent for the same period [49]. The population of India grew by one and half times in the first half in the 20th century. The period from 1901 to 1921 is recognized as the period of stagnant population. During this period, India's population increased from 238.4 million to only 251.3 million. The year 1921is marked out to be a significant demographic break up as in the post period the population started to increase drastically.

During the period from 1921 to 1951, the population of India increased from 251.3 million to 361.1 million. The Indian demographic structure witnessed significant changes during this period. The population of India has more than doubled itself since 1951 and in 2001 it has increased to 1027million. As per the 2011 census, the total population of the country was enumerated at 1210.6 million. Thus on an average, it has been increasing at a growth rate. India showed a decadal growth rate of 17.7 percent for the entire population during period of 2001- 2011 as compared to 21.5 percent in Census of 2001.The decadal growth rate is a vital part of Census operations. This gives an overview of the percentage of total population growth in a particular decade.

The population trend and decadal growth rate of Assam and India is presented in Table 1.1 and 1.2 respectively.

Table 1.1: Population Trend of Assam and India from 1901-2011

Year	Population		Percentage of Decadal Variation		Density (Person per sq.km.)	
	Assam (in millions)	India (in millions)	Assam	India	Assam	India
1901	3.3	238.4	-	-	42	77
1911	3.8	252.1	17.0	5.8	49	82
1921	4.6	251.3	20.5	-0.3	59	81
1931	5.6	278.9	19.9	11.0	71	90
1941	6.7	318.6	20.4	14.2	85	103
1951	8.0	361.1	19.9	13.3	102	117
1961	10.8	439.2	35.0	21.5	138	142
1971	14.6	548.1	35.0	24.8	186	177
1981	*18.0	683.3	*23.4	24.7	*230	230
1991	22.4	846.3	24.2	23.9	286	267
2001	26.6	1027.0	18.9	21.5	340	325
2011	31.2	1210.6	17.1	17.7	398	382

*Interpolated

Sources: (a) Census Report of India, Government of India, 2011

(b) Economic Survey, Assam, 2014-15

Table 1.2: Decadal Growth of Population of Assam and India (in percentage)

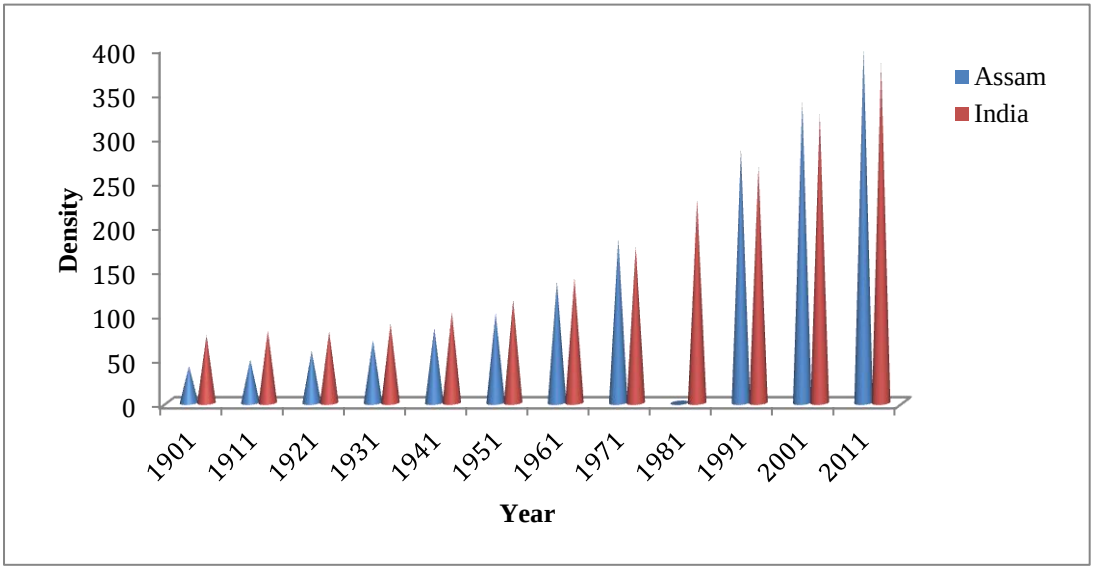
Year	Assam	India
1901-11	16.99	5.75
1911-21	20.48	-0.31
1921-31	19.91	11.00
1931-41	20.40	14.22
1941-51	19.93	13.31
1951-61	34.98	21.64

1961-71	34.95	24.80
1971-81	23.36	24.66
1981-91	23.87	24.24
1991-2001	18.92	21.54
2001-2011	17.07	17.68

Source: Census Report of India, Government of India, 2011

From the above Table 1.2 it is seen that the decadal growth rate of population of Assam is slightly different from the national growth rate. Further, as shown in Fig1.1, from the second half of the century, population density in Assam has become greater than that of national average. The density of population of the state has gone up as against India's density as per 2011 census [22].

Fig.1.1: Density (per sq.km.) of Assam and India, 1901-2011



Source: Census Report of India, Government of India, 2011

Also, the corresponding state's figure as per 2001 census was 340 against the density of population of India was 325. The difference is not normal; perhaps it is caused by continuous migration from the neighboring states and countries in normal time. The census of 1981 was not conducted in Assam due to disturbed condition hence it is not presented in the above figure.

1.3.1 Rural-Urban Population of Assam and India

Irrespective of districts, the average population of Assam is noticeable for the period under study. As per population Census of 2011, the rural population of the state was 85.92 percent of the total population. The percentage was much higher than thenational level which is 68.84 percent. The following table shows the rural- urban population of Assam and India.

Table 1.3: Rural- Urban Composition of Population (in percentage)

Category	Assam	India
Rural	85.92	68.84
Urban	14.08	31.16
Total	100	100

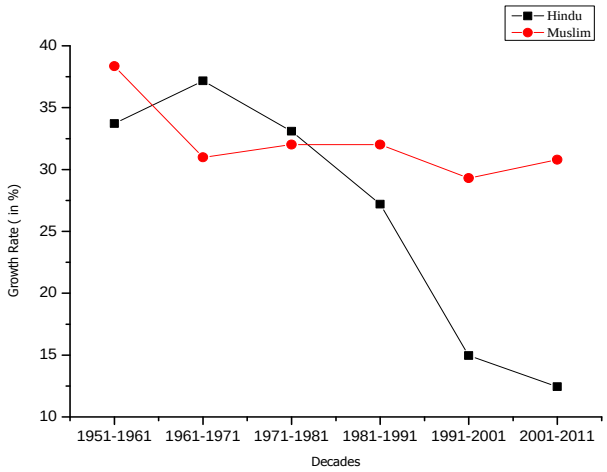
Source: Census Report of India, Government of India, 2011

The proportion of urban population in the state increases from 12.9 to14.08 percent in the period of 2001-2011.

1.3.2 Religion wise Population of Assam and India

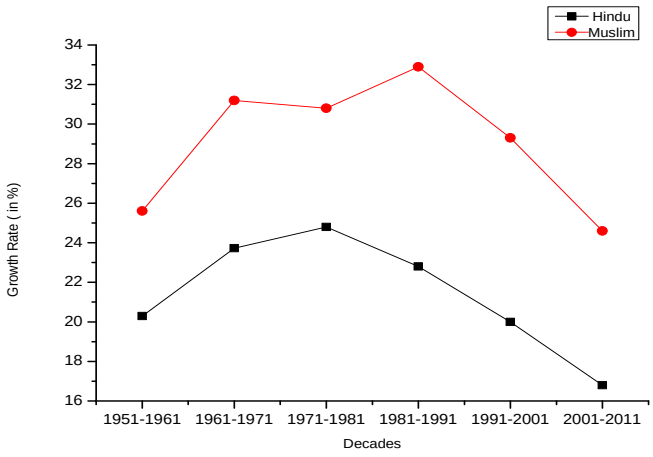
Religious profile of the population is an important demographic feature which was manifested from the first Census in 1872 to till now. During the last several decades, the proportion of Muslims in India's total population has been steadily increasing and the proportion of Hindus steadily falling. The growth rate has been consistently higher for Muslims than for Hindus in all intercensal decades. The increase in percentage during 1951-61 and 1961-71 were 20.29 and 23.72 respectively, for Hindus and 25.61 and 31.2 respectively, for Muslims in India [7]. This increase is largely related with a higher fertility rate among Muslim women. The observed differential in growth rates between Hindus and Muslims must be sought in terms of differential in the component of population growth. The decadal growth of both state and national level are evaluated and is presented in Fig.1.2 and Fig1.3.

Fig.1.2: Decadal growth of Hindu and Muslim of Assam



Source: Census Report of India, Government of India, 2011

Fig. 1.3: Decadal growth of Hindus and Muslims of India



Source: Census Report of India, Government of India, 2011[2]

The religious data of India in Census of 2011 was released by the government on 25th August 2015. Here it was reported that in India, Hindus slide from 80.5 percent to 79.8 percent while Muslims climb from 13.4 percent to 14.2 percent [22, 43].It is to be noted thatHindu population falls below 80 percent for the first time in over a century. On the other hand, in the period of 1961 to 2001, the combined share of Hindu and Muslim is almost remaining unchanged. Muslims in India continue to

[2] Census of 1981 was not hold in Assam. The data for the period 1971-81 and 1981-91 are estimated.

have more children on average than Hindu. Projections for the future population growth in India show that by the end of the 21st century, India's total population will stabilize in which the Muslim population would be less than 20percent of total, as noted by the Sachar Committee.The projected population [42] of Hindu and Muslim has been given in the following Table 1.4.

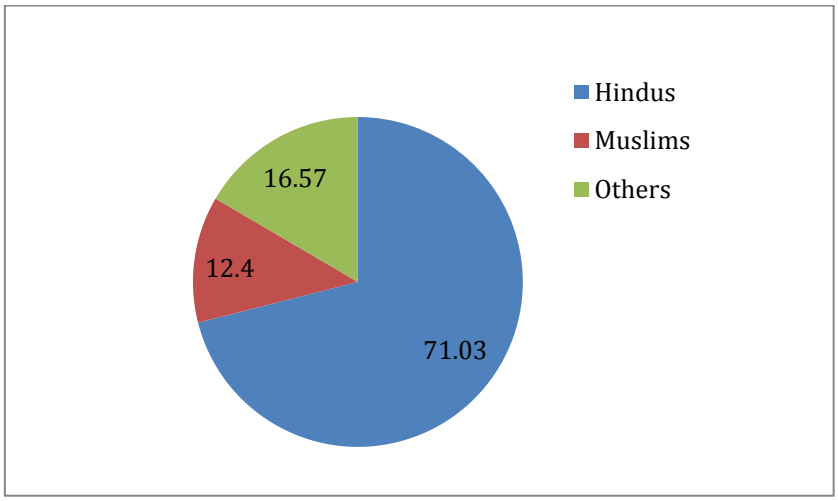
Table 1.4: Projected population of India

Year	2021	2031	2041	2051
Hindu	79.1	78.4	77.7	77.0
Muslim	15.1	16	17	18

Source: Census Report of India, Government of India, 2011

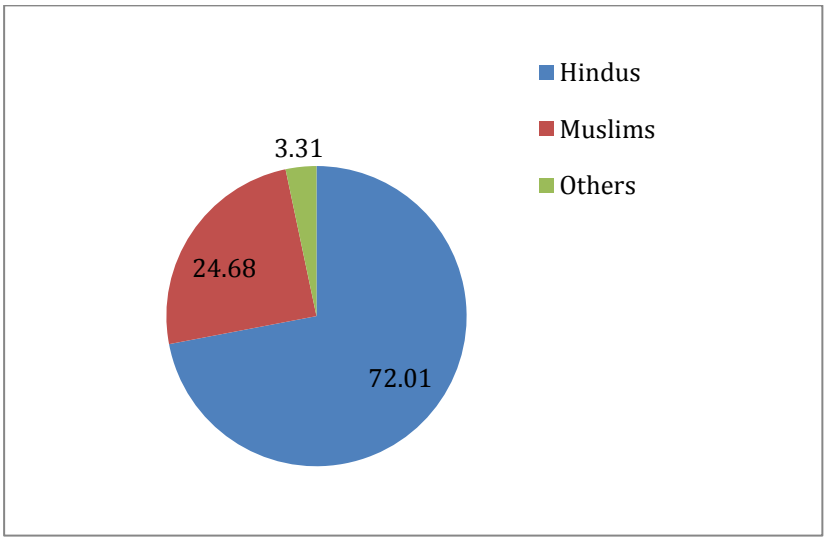
According to population census of 2001, religion wise percentage distribution of population reveals that out of total population in the state, Hindus were shared by 64.89 percentage and 30.92 percent were Muslims. During the periods of 1971-91 and 1991-2001 the average annual growth of Muslim in Assam were 38.7 and 29.3 percent respectively. In these periods the growth of other religion was 21.8 and 13.9 percent only. Also, the corresponding estimated average natural growth rates of Assam were only 19.6 and 18.7 percent. Hence it can be stated that the growth of Muslim populations are enormously high in Assam during 1971-2001. In 1901, out of total population in the state, Hindus were 71.03 percent and only 12.4 percent were Muslims. The Muslim population of Assam had almost doubled from 12.40 percent in 1901 to 24.68 percent in 1951 [22]. In the census report of 2011 it is seen that the percentage of Muslims increases to 34.22 percent. Since then, Muslim population has been increasing consistently till now. Muslim women are seen to reproduce more liberally than all other religions and caste groups. The figures from Fig.1.4 to Fig. 1.6 depict the Pie diagram of the population growth structures of Assam since 1901 to 2011.

Fig.1.4: Population (in percent) for the year 1901



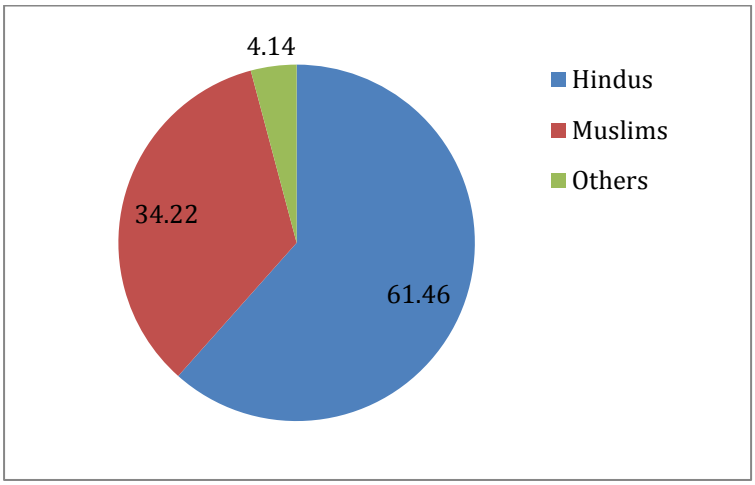
Source: Census Report of India, Government of India, 2011

Fig.1.5: Population (in percent) for the year 1951



Source: Census Report of India, Government of India, 2011

Fig.1.6:Population (in percent) for the year 2011



Source: Census Report of India, Government of India, 2011

From these population structures, it may be perceived that Hindu and Muslim play a foremost role in the growth of population. The other religions like Jain, Buddhist, Christian etc. are insignificant in this regard. Assam is the state where proportion of Muslim population is more than 30 percent of the total population of the state.

In Assam Islam is the second largest religion. It is also fastest growing religion in Assam according to 2011 Census report [21]. As a consequence total demography of Assam is being change. The demography as a whole in the world is concerned with understanding the fertility behavior. It is a key driver of the size and composition of the population. Fertility may be defined as the number of live births that a woman produces during her reproductive span; or, it is the child-bearing activity of a population. Fertility refers to the actual production of children. It refers to the number of live births relating to a woman. Only a particular section of the females has the capacity to bear children viz. females belonging to the age group 15 to 49. It is to be noted that only live births are to be taken into account while measuring fertility because only a live birth accounts for increase in population. Fertility is the single most important determinant of population dynamics and growth. Fertility is directly influenced by a set of sociological and biological factors [29]. The factors such as women's age, education level, age at marriage, economic status and religious attitudes etc., are often called intermediate fertility variable.

Women's age is directly related to fertility. The term religion plays an important role in determining the attitude of the people in limiting the fertility. Religion disparities play an important role in declining or increasing fertility.

According to 2011 census report, Islam is the fastest growing religion in Assam. The demography as a whole in the world is concerned with understanding the fertility behavior and the term fertility is related to the population projection. Since, several districts of Assam have shown a very low rate of growth, while Muslim majority districts like Dhuburi, Goalpara, Barpeta, Nagaon and Marigaon in lower Assam, and also Hailakandi and Karimganj have grown at a much higher rate than the average of the state. The Table1.5 and Table 1.6 show the share of Hindu and Muslim population more than 50 percent in the total population.

Table 1.5: Districts having more than 50 percent Hindu Population

Districts	Hindu Population(in percentage)
Kokrajhar	59.63
Sonitpur	73.94
Lakhimpur	76.48
Dhemaji	95.47
Tinsukia	88.96
Dibrugarh	90.35
Sibsagar	87.5
Jorhat	92.3
Golaghat	85.99
Karbi-Anglong	80.09
DimaHasao	67.08
Cachar	59.82
Chirang	66.5
Kamrup	57.82
Kamrup (M)	84.22
Nalbari	63.7
Baksa	82.4
Udalguri	73.63

Source: Census Report of India, Government of India, 2011

Out of the 27 districts, nine districts have shown increase in the decadal population growth rate. The growth rate in these districts is ranging from 20 percent to 24 percent during the last decade.

Table 1.6: Districts having more than 50 percent Muslim Population

Districts	Muslim Population(in percent)
Dhuburi	79.67
Goalpara	57.52
Barpeta	70.74
Morigaon	52.56
Nagaon	55.36
Karimganj	56.36
Hailakandi	60.31
Bongaigaon	50.22
Darrang	64.34

Source: Census Report of India, Government of India, 2011

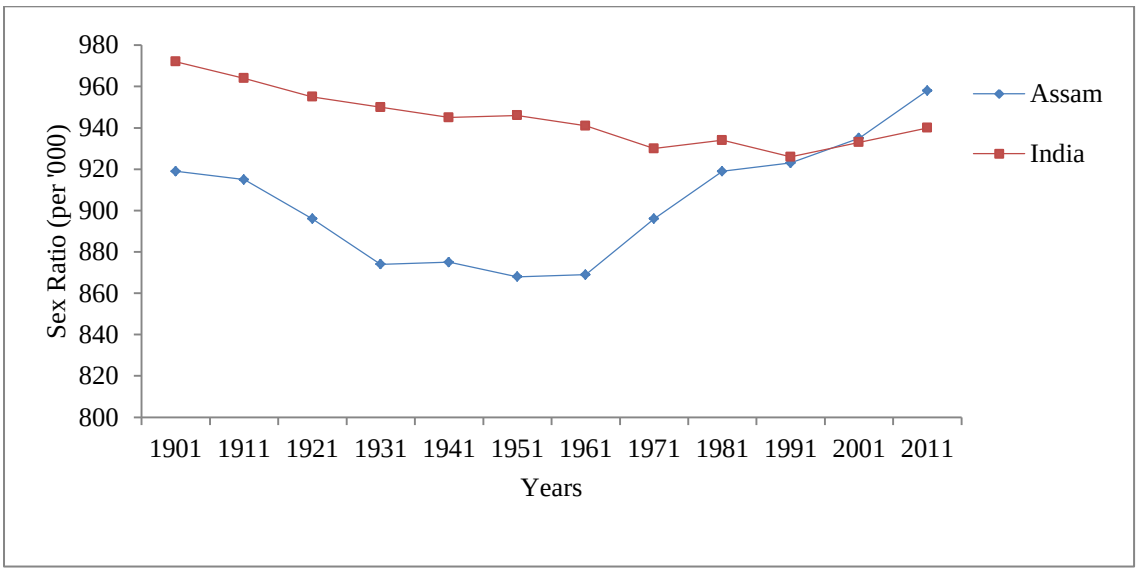
The total share of Muslim population in the districts of Goalpara and Nagaon were 4 percent to 6 percent in 1901. But right now these are elevated above 50 percent. Similarly Barpeta district (part of the undivided Kamrup) had 0.1 percent Muslims in 1901 but it has risen to 70.74 percent. The growth rate of Muslim population was normal during the period of 1911 to 1971. After that a noticeable growth of Muslim population has been seen.

1.4 Sex Ratio and Literacy Rate of Assam and India

The term sex ratio and literacy rate is an important factor for population growth analysis. Demographers generally use Sex-ratio to depict the proportionate share of female in the population sample. The sex ratio of a country or community is an important indicator for measuring their socio-economic condition as well as the extent of prevailing equality between male and female at a given point of time. Declining sex ratio is one of the serious problems. Population growth mainly depends on the sex of the newly born children [4]. That is, the population growth rate increases if the majority of births consist of girls. So, it becomes necessary to take

accounts of the female births [48]. The Child sex ratio (0-6 years) has dipping further from 927 in 2001 to 914 girls for every 1.000 boys and reaching the lowest level since 1961. In India, sex ratio is a crucial measure where preference for sons and the desire for smaller families have driven down the number of girls. The sex ratio for Assam and India is depicted in Fig1.7. The sex ratio in the state shows some improvement from 935 in 2001 to 958 in 2011.

Fig. 1.7: Sex Ratio of Assam and India



Source: SRS Bulletin, R.G.I., New Delhi

Literacy gives the best indication about the socio-economic development of a society. According to census of India 2011, in the provisional population total, it is seen that, in the year 1951 the literacy rate of female for Assam was 7.58 whereas for India it was 8.86. But, in the year 2011 it is reversed, that is the literacy rate of female for Assam was 67.27 and for India it was 65.46. Hence, it is observed that female literacy of Assam showing better performance compared to all India [22]. The total literacy rate and male literacy rate of Assam indicate a little poor performance compared to all India figure.

Table 1.7: Literacy Rate (in percentage) of Assam and India

Year	Person		Male		Female	
	Assam	India	Assam	India	Assam	India
1951	18.53	18.33	28.01	27.16	7.58	8.86
1961	32.95	28.30	44.28	40.40	18.62	15.35
1971	33.94	34.45	43.72	45.96	22.76	21.97
1981*	40.01	43.57	51.01	56.38	30.99	29.76
1991	52.89	52.21	61.87	64.13	43.03	39.29
2001	63.25	64.84	71.28	75.26	54.61	53.67
2011	73.18	74.04	78.81	82.14	67.27	65.46

Sources: (a) Census Report of India, Government of India, 2011

(b) Economic Survey of India, 2010-11

The birth rates, death rates and infant mortality rates are also related to female education. The data obtained from the Sample Registration Bulletin published by Registrar General of India depicts about the trend in the birth, death and infant mortality rates in Assam which were found to be higher than that of the country as a whole, although there has been a trend of gradual decline. The Table 1.8 shows the birth, death and infant mortality rates of Assam and India from 2001 to 2012.

Table 1.8: Birth Rate, Death Rate and Infant Mortality Rate, 2001-2012

Year	Birth Rate		Death Rate		Infant Mortality Rate	
	Assam	India	Assam	India	Assam	India
2001	27.0	25.4	9.6	8.4	74	66
2002	26.6	25.0	9.2	8.1	70	63
2003	26.3	24.8	9.1	8.0	67	60
2004	25.1	24.1	8.8	7.5	66	58
2005	25.0	23.8	8.7	7.6	68	58
2006	24.6	23.5	8.7	7.5	67	57
2007	24.3	23.1	8.6	7.4	66	55
2008	23.9	22.8	8.6	7.4	64	53
2009	23.6	22.5	8.4	7.3	61	50
2010	23.2	22.1	8.2	7.2	58	47
2011	22.8	21.8	8.0	7.1	55	44
2012	22.5	21.6	7.9	7.0	55	42

Source: Sample Registration Bulletin, R.G.I., New Delhi

From the above Table 1.8 it is seen that the birth rate decreases gradually in both national and state level.It affects on population growth directly. The study of Total Fertility Rate (TFR) is crucial measure of fertility analysis. There are large differences in fertility by region or area. It also varies with different religion community or economic status. The variation of total fertility rate for the period of 2008 to 2013 is finding out in respect of rural and urban which is recorded in Table1.9.

Table 1.9: Total Fertility Rate of Assam and India

Year	Assam			India		
	Total Fertility Rate (TFR)			Total Fertility Rate (TFR)		
	Rural	Urban	Total	Rural	Urban	Total
2008	2.8	1.5	2.6	2.9	2.0	2.6
2009	2.8	1.6	2.6	2.9	2.0	2.6
2010	2.7	1.6	2.5	2.8	1.9	2.5
2011	2.6	1.5	2.4	2.7	1.9	2.4
2012	2.5	1.5	2.4	2.6	1.8	2.4
2013	2.4	1.5	2.3	2.5	1.8	2.3

Source: Ministry of Health and Family Welfare Statistics, India, 2011

1.5 Background of the Study

A considerable variation exists in terms of the base year, the migration assumptions and the fertility scenarios adopted for national and state level, the available research works reach several conclusions. The following research paper and reports present details and results of our review approach. Here we introduce our investigations outlining the processing of the articles.

The paper by Bhagat and Praharaj [8] reported that Hindu-Muslim differential in fertility persists in India's demographic reality. Here decline is found in the proportion of Hindus, from 75.1 per cent in 1881 to 72.9 percent in 1901. It is also mentioned that population growth rate of Muslim has continued to be higher than that of the Hindus during the last five decades.

The report by Rajan [56] describes on Fertility rates for Hindus and Muslims. In the report it reconfirms that there is a regional variation in fertility in India. Fertility is measured by quantifying the birth performance of a population over a

period of time. In demography, fertility refers to the actual birth performance of a group of women or to the rate at which the births occur in the population exposed to it. Hence, by analyzing the 2001 Census data on TFR showed that there was a difference between TFR of Muslims and Hindus of Assam.

Basu's investigation [5] finds the relationship between fertility decline and increasing gender inequities in the north and south regions of India. The analysis was based on Census data of India, 1991 and the Sample Registration Scheme in 1981 and 1991. The Birth and death rates was found to be varied by religion and socio-economic status. In the paper it was also reported that the fertility is lower in southern part of India. The sex ratio has risen over time in both the north and south. Fertility decline appears to be influenced by modernization. The south has improved female education.

According to Rajput [57], the health of Indian women is inherently linked to their status in society. Research on women status has found that many of the health problems of Indian women are related to fertility.

In, 1798, the Englishman Thomas R. Malthus [47, 50] proposed a mathematical model of population growth. His model has become a basis for the prediction of future biological population. He believed that human population increases geometrically (i.e. 2, 4, 8, 16 etc.) whereas food supplies can only grow arithmetically (i.e. 2,4,6,8 etc.) as it is limited by available land and technology. The paper by Dey and Goswami [29] reported that religion plays an important role in determining the attitude of the people in limiting the fertility.

According to the two reputed institutions of Bangladesh [54, 55] the findings are alarming because these were based on the census reports of Bangladesh of 2001 and 2011. It was reported that despite a rise in the Hindu population, their percentage had gone down, whereas for Muslim population it is gone up. It is also significant that high growth of Muslim population in Assam may due to the consequence of large scale migration from Bangladesh. Religion disparities also play an important role in declining or increasing fertility. The high fertility rate is found in the Muslim population compared to Hindu population.

Toru Suzuki [69] mentioned in his paper that a women's first child birth occurs at parity 0, the number of births of birth order $i+1$ is divided by the female population of parity i. If $p(x,\ i)$ is the parity distribution of women of age *x*, then

$$\sum_i p(x,i) = 1$$

The paper by Feeney and Yu [36] includes period parity progression based measures of fertility for china as a whole and for rural and urban areas for the years 1955-81.

The report by Dreze and Murthi [33] mentioned that the poverty is an important cause of high fertility. Female literacy is significant factor for change in fertility. This effect is upheld even when we allow for the factors such as male literacy, poverty, urbanization, caste and religion and for unobserved district specific influences on fertility. It also includes that son preference as an important determinant of fertility level. The high fertility is motivated by the desire for son; it may go hand to hand with high mortality among unwanted girls. The strong effect of female literacy, child survival and son preference on fertility level contrasts with the tenuous correlation between the latter and various indicators of overall development of modernization such as male literacy, urbanization and even poverty. None of these variables exert a statistical significance influence on fertility. This study also suggests that it would be unwise to rely on income effects to reduce fertility on their own.

The paper by Yadava and Kumar [70] reported that, total fertility rate plays a very important role on overall fertility performance of any population because of the fact that it not only reflects the extent of family limitation practices that are being followed in that population but also determines total fertility of that population. The paper deals with estimation of parity progression ratios utilizing the data on open and closed birth intervals.

The paper of Bhardwaj et.al. [12] reported that, with changing reproductive patterns of population overtime, it has become more important to know the process of family building as to how many women are moving from the lower parity to

higher parity and in how much time the pattern of fertility advancement from i^{th}parity to (i+1) this dealt through parity progression ratios and finally a life table on the parity progression has been constructed.

The paper by Yadava et.al [71] has made an attempt to estimate parity progression ratio values by utilizing procedure for various states of India using National Family Health survey (NFHS) data of different rounds and found that for some Southern states the estimates of parity progression ratios were unreasonable and sometimes negative also.

Literacy influences [39, 43, 44] the major population features like fertility, mortality, and age of marriage and economic participation. It determines the fertility pattern both in qualitatively and quantitatively.

The paper by Barooah and Iyer [19] proposes a new explanation for religious differences in fertility in India by incorporating the issue of gender bias into the debate. It was paid particular attention to religion and caste by subdividing the sample into Hindu, Muslim and Dalit women who had all terminated their fertility.

The paper by Nath and Nath [54] studied the change of population composition in terms of religion and language in the districts of the state Assam. The result shows that the proportion of Muslim population has been rapidly increasing in some districts whereas the Hindu population is declining and losing share in all the districts of Assam.Here, it is also mentioned that Hindu and other religions may become minority in Assam after 2040 in comparison to combined proportion of Muslim and Christian population.

The paper [72] has reported that a high income country can be characterized with high female participation, high growth and low fertility. Another report is mentioned that there are many factors such as social and cultural changes that affect the interrelationship between female labor supply, fertility and growth.

The fertility rate is very high in Assam as in some other parts of the country (DLHS, Assam, 2007-08) [32, 33]. This situation persists basically due to the lower age of marriage, low level of literacy, poor economic status of the couple, large family size, sex consideration, ignorance, taboos, myths, customs and superstitions and often non-availability of means of reproductive choice.

The paper by [62] Sheikh reported that, population growth in Dhuburi district is continuing to be highest in Assam in the last three consecutive national population censuses of India and it is alarming among the Muslim people of the district. The paper deals with population growth and poverty among the Muslim population of Dhuburi district.

1.6 Sources of Data

The entire investigation has been carried out on the basis of secondary source of information. The data and information have been collected from following sources:

- Census Report of India, Government of India, 1971, 1991, 2001 and 2011.
- Economic Survey, Assam-2011-12, 2012-13, 2013-14, 2014-15, 2015-16, Directorate of Economics and Statistics, Assam.
- Statistical Hand Book, 2012, 2013, 2014, 2015. Directorate of Economics and Statistics, Assam, Guwahati.
- Sample Registration Bulletin, R.G.I., New Delhi.
- DLHS-3, India (2007-08), Assam (2007-08); Ministry of Health and Family Welfare, Government of India.
- Human Development Report of Assam, 2013, Government of Assam.
- Annual Health Survey Bulletin 2011-12, Assam. Office of Registrar General & Census Commissioner, India.

1.7 Objectives of the Study

The objectives of our thesis are:

1. Classification and Ranking of districts of Assam based on growth of population.
2. To examine the fertility differentials in terms of religion, mainly Hindu and Muslim communities in Assam.
3. To examine Parity Progression Ratio of these two communities and also to compute Complete Fertility Rate.
4. To study the district wise demographic disparities of two major communities.
5. A district wise comparative study on the fertility and gender bias in Assam.

1.8 Methodology

Different chronological methods have been followed in investigation and analysis of the work. The major approaches are - i) Correlation and Regression methods, ii) Least square method and iii) Principal Component Analysis. The basic demographic indicators with which investigations have been performed are described in below.

1.8.1 Total Fertility Rate (TFR)

The total fertility rate is the number of children which a hypothetical cohort woman would bear during her life time [39, 52]. Total fertility rate has all the information contained in ASFR and at the same time it offers a general index of fertility, Crude Birth Rate (CBR) and General Fertility Rate (GFR) for the entire childbearing women population. It is defined as the average number of babies born to a women during her entire reproductive career(15-49 years), assuming that she would remain alive throughout her reproductive period and that she would produce babies at rates defined by ASFR exhibited in the population to which she belongs. Total fertility rate, the most popular index of fertility, for a given region during a given period is defined as,

$$TFR = \sum_{x=15}^{49} ASFR_x$$

$$= \sum_{x=15}^{49} \frac{B_x}{{}^{f}p_x} \times 1000 \qquad (1.1)$$

Where,

$ASFR_x$ = Age-specific fertility rate per 1000 of the female population.

B_x = Number of live births to women of age x.

${}^{f}p_x$ =Number of women of age x.

TFR gives the expected number of children that a group of 1000 women beginning their life together will bear in their life time if none of them dies before crossing reproductive age period. It is an index of overall fertility of a community.

In particular, if we deal with quinquennial age group i.e. n = 5 for each class then we have,

$$\text{T.F.R.} = 5\Sigma_5 i_x \qquad (1.2)$$

This equation (1.2) is used when a 5-years age interval is used.

1.8.2Age-Specific Fertility Rate (ASFR)

It is defined as the number of live birth in a specific age-group of women per thousand female population of that age-group [39]. ASFR is more meaningful for fertility analysis since the specific rates tell us which group of female is showing changes in birth rates and which are relatively static. Age Specific Fertility Rate is adjusted for age and determines the fertility rate of women in each age-group, usually in 5 years interval i.e. 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49. It is given by

$$_n i_x = \frac{nB_x}{{}_n^f P_x} \times k \qquad (1.3)$$

where,

$_n^B{}_x$ = No. of live birthsto females in the age group (x, x+n) in the given region during the given period.

$_n^f P_x$ = No. of femalein the age group (x, x+n) in the given region during the given period.

k = usually 1000.

The age specific fertility curve seems to be closer to a bell shaped curve.

1.8.3 Gross Reproduction Rate (GRR)

Gross reproduction rates are the total number of live female birth per female for a given period. If a majority of births are those of girls, the population is bound to increase while it will have a downward trend if the majority of birth is boys. Symbolically, if ${}^{f}B_x$ is the number of female birth to the women of age x during the given period in the given region, then the usual notations, we have

$$GRR = \sum_{x=15}^{49} \left(\frac{B_x}{{}^{f}P_x} \times \frac{{}^{f}B_x}{B_x} \right) \qquad (1.4)$$

Since, $\frac{{}^{f}B_x}{B_x}$ does not varies with age of mother, it can be approximated by the constant $\frac{{}^{f}B}{B}$, the overall sex ratio at birth. Thus GRR can be approximated as,

$$G.R.R = \frac{{}^{f}B}{B} \times \left(\sum_{x=15}^{49} ASFR_x \right)$$

$$= \frac{\text{No. of female births}}{\text{Total no. of births}} \times TFR, \text{ per women}$$

$= \text{TFR} \times \text{proportion of female births}$

GRR define above is a measure of average number of female children which would be born to a female if she is subjected to the observed rate of fertility but not subjected to mortality.

1.8.4 Parity Progression Ratio (PPR)

Parity progression ratio (PPR) is the proportion of women who progress from one parity to the next [12, 66]. The concept of PPR was introduced by Henrey in 1953 as a useful measure of fertility. Parity progression ratio as it is normally referred inthe literature is the chance that a woman after delivering her i^{th} child will ever proceed to the next parity. That is, it will have an additional child in future. Parity Progression Ratio is a crucial factor in the explanation of fertility differentials among the populations [70, 71].

1.8.5 Sex Ratio

For comparing the relative strength of the nature of male or female in a population, the common measure used in the sex ratio[47]. It is defined as

$$\left.\begin{aligned}\text{Sex Ratio} &= \left\{\frac{\text{Number of females in a population at time}}{\text{Number of males in a population at time}}\right\}\times K\\ &= \frac{{}^{f}P}{{}_{m}P}\times 1000\end{aligned}\right\} \quad (1.5)$$

1.8.6 Women Education Level

Literary rate indicates how many people are educated in a certain time span. It can be defined as

$$\text{Literacy rate} = \frac{\text{Number of educated people at time t}}{\text{Total population at time t}} \times 100 \quad (1.6)$$

$$\text{Women literary rate} = \frac{\text{Number of educated women}}{\text{Total number of women}} \times 100 \quad (1.7)$$

1.9 Outline of the thesis

The dimensions of entire investigation are categorized in separate chapters. The chapters have been formulated in such a way that it can give a total reflection of the study area.

The Chapter1 is the introductory one. It provides the brief description about the growth of population of Assam and India.District wise growth of population of Assam is also mentioned here. The methodologies and objectives of the study are mentioned here. It provides the details about the study area and availability of the data for the study and provides the outline of the thesis.

In Chapter 2, anattempt has been made to evaluate a district wise demographic profile of Assam for two communities. Ranking has been madeon the basisof differentials of fertility. The population growth of Assam is very high which is even higher than the country's average growth. It is observed that there is an inter district disparities in the growth of population in Assam. Five districts of lower Assam, i.e. Dhuburi, Goalpara, Darrang, Barpeta, Bongaigaon, two districts of Barak valley, i.e. Karimganj and Hailakandi, and two districts of Middle Assam i.e. Nagaon and Marigaon, are showing very significant growth rate of population. These nine districts have higher growth rate (ranging from 20 per cent to 24 percent) during the last decade against national average (18 percent). On the other hand, the eastern Assam districts situated mostly in upper Assam registered around a 9 percent population growth only. Muslims constituted 30.92 percent of the state's total population in 2001 and it has risen to 34.22 percent a decade later. The population density is highest in the Nagaon district having 604 persons per sq.km. The proportion of Muslim in Dhuburi district is the highest, 79.67 percent, which may be due to lowest literacy rate of 58.34 percent according to Census of 2011. It is noted that districts of Assam which are closed to Bangladesh border are showing significantly high population growth.

In Chapter 3**,** it is tried to highlight the district wise fertility differentials and its change for two communities of Assam. The differentials of Age Specific Fertility Rate (ASFR), General Fertility Rate (GFR) and Gross Reproductive Rate (GRR) are observed for the said communities. The analysis is based on district level census data of 2011 for Assam. The result shows that age wise fertility proportion of Muslim population has been rising rapidly in some districts whereas the Hindu population is declining and losing their share in some other districts of Assam. The similar results are observed for General Fertility Rate and Gross Reproductive Rate.

In Chapter 4, Parity Progression Ratio (PPR) and Complete Fertility Rate (CFR) of two communities for each district of Assam have been estimated. The Complete Fertility Rate for both rural and urban women populations have alsobeen computed for each district of Assam. It is also tried to evaluate the relationship

between Parity Progression Ratio and Complete Fertility Rate of two major communities.

In Chapters 5, demographic disparities of two communities, i.e. Hindu and Muslim have been investigated based on data available in Census Report. Classification of districts has been made on the basis of certain demographic indicators using the method of Principal Component Analysis. It is observed that there is an inter district disparities in the growth of population in Assam. Significant disparities in socio- economic development have also been found in respect to religion.

In Chapter 6, the projected future populations of Hindus and Muslims have been estimated for the years 2021, 2031, 2041 and 2051 respectively. The projection of population has been made using Least Square Method.Thegrowth rate of Muslim population seems to be significant particularly few districts.The proportion of Hindu has been found in decreasing trend.

In Chapter 7, a district level analysis has been made. This chapter examines some of the relevant relationship based on a cross section analysis of district level data from the 2011 Census of India. All the 27 districts of Assam have been considered in this investigation. The output highlighted under the study based on the literacy rate, gender imbalance and related demographic and socio-economic factors.