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CLIMATE CHANGE AND ITS IMPACT ON TEA PLANTATION: A STUDY OF NORTH INDIAN TEA GROWING REGION

Razia Bano
Research scholar, Department of Geography, AMU, Aligarh, E-mail: razia8habib@gmail.com

Abstract: *The problem of climate change has been felt by all over the countries. Climate change is an important environmental issues and impacts gradually over the Indian agricultural pattern especially on those crops that are dependent on consistent climatic condition like tea plantation. It impacts greatly on growth and production of tea because it is mainly grown under rain fed mono cropping systems and weather conditions determine optimal growth. Changes in climate have socio economic impacts on the tea estates and plantations themselves as they meeting additional expenses to maintain production which cannot be addressed by increasing tea prices, if they want to compete in the international tea market. The objective of this paper is to show the declining trend in the terms of production and export in northern growing regions since last decade. The paper deals how and at what extent does climate change responsible on the declining trend. This paper is based on secondary data that has obtained from the various ministries report, magazines and online data sources whereas climatic data has been obtained from the metrological department. The analysis has been done with the help of statistical techniques such as correlation and percentage method, the results has been shown with the help of tables, graphical pictures and charts.*

Keywords: *Tea Plantation, Climate Change, Tea growing region.*

Introduction: Tea plays a very pivotal role in rural development, poverty reduction and food security in the rural population hence gives the balanced socio economic development to the nation. The importance of the tea plantation assumes a deep social dimension in view of its capability to provide gainful employment, both direct as well as indirect, to a huge number of populations from remote corners of the nation [1]. Tea in India has grown in 15 states over an area accounts 16 percent of total tea cultivation in world. India is one of the leading countries in both the tea production and tea consumption. It is the largest producer as well as consumer of black tea and significantly 80 percent of the total production is consumed within the country. It is one of the most important cash crops goes for export and provides economic strength to the country. The tea producing region in India clearly demarcated between North and South India that occupies more than 90 percent production of Tea. The major tea producing states of North India is Assam and West Bengal whereas Tamil Nadu, Kerala, Karnataka and Andhra Pradesh are in South India. The lush green view of which the sector epitomizes can fill any country and its people with pride and inspiration [1]. This is also environmentally very significant that it is one of the biggest carbon sink and conservatory of flora and fauna. In view of immense implication of tea plantation has on the social, economic and environmental fabric of the country needs to concern and attention on their decreasing production. The problem of climate change has been felt by all over the countries. Climate change is an important environmental issues and impacts gradually over the Indian agricultural pattern especially on those crops that are dependent on consistent climatic condition like tea plantation. It impacts greatly on growth and production of tea because it is mainly grown under rain fed mono cropping systems and weather conditions determine optimal growth [2]. Changes in climate have socio economic impacts on the tea estates and plantations themselves as they meeting additional expenses to maintain production which cannot be addressed by increasing tea prices, if they want

to compete in the international tea market. The climate has always been changing naturally, the current impact of human activities is causing the climate to change in an unnatural way and at faster pace than ever before. According to the report by Aljazeera, The decrease in demand of Indian tea at global market disappoints the landholders at large and adversely impacts on the millions of worker's life that solely depend on it. The fluctuation in the production of tea depends on the rainfall condition of the region .The reduction in the amount of production also leads the reduction in export of tea that impacts negatively in the economy of the country. According to a report of Abhinaw Ghosh, the tea leaves has been lost its sheen due to unwelcome transformation has been started since last 10 years. In this regard Indian Tea Association in 2014 reported that 8 percent less export was due to less rainfall. The Northern Indian tea is seasonal crop and the season used to comprise of more than 9 months per year earlier. This has down to 7 months or so per year. If the trend continues the tea garden workers will be jobless for half of the year. The workers indulge in the tea plantation solely depend on this and life of these workers also fluctuates with the fluctuation of climatic condition. The tea plantation workers suffers the low wage because after paying them their wage, the tea plantation owners have to maintain costs of pesticides, irrigation and electricity, Given the fact most tea gardens keep permanent work forces, feeding them all over the years has become harder. This is why the tea firm are not hiking wages of tea workers. This results into the decrease of workers in the tea production [3].

A literature Review of impact of climate change on tea plantation: State that, climate change is the greatest global challenges facing making this century and since Africa is one of the most vulnerable region, most likely to suffer from its effects [4]. In a study on the impact of climate change and agriculture in Uganda, tea plant is highly dependent on rainfall and vulnerable to drought [5]. Further reported that tea is highly sensitive to higher temperature, which cause leaves to wilt and decline of is quality. It further suggested that the suitable low land growing region of Uganda will decline significantly by 2050. Examine tea, the most widely consumed beverage after water in the world [6]. It was a study of major tea producing region of climate during in extreme drought events that were most likely to more frequent with climate change. This study suggests that the drought occurrence was due to climate change will lower down the production of tea upto 50% in these areas. Studied the rain fed condition of tea growing region of Kenya [4]. Study was an attempt to find out the link between climatic variables and tea production in Kenya. The study was an assessment of tea vulnerability to climate change and using statistical analysis linking historical climate data trends with tea yield in Kenya based on time data series. His study showed that there were positive link between temperature and tea yields when soil moisture is not limiting.

Climate Change and Tea Plantation: Due to lots of climatic factor as shown in the fig.1 upon which tea plantation is affected. Climate change has defined as the long term changes in the earth's climate due to natural mechanical and anthropological processes which results in emission of green house gases like CO2, methane, etc. These are settled down in the stratosphere and trap the heat within the atmosphere leading to global warming and thus cause of changing the climatic patterns. Increasing global temperature, shifting of seasons, rising sea levels, changing agriculture patterns have resulted in frequent disasters like landslides, tsunamis, drought, famine, population migration and major health hazards [7]. The United Nation Framework Convention on Climate Change (UNFCC) described it as change of climate which is attributed directly to human activity that alerts the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods, and also describes it is a long term shift in the statistics of the weather (including its average).According to climate scientists as a result of climate change billions of people, particularly those in developing countries could face shortage of water and food and also face and also face greater risk to health and life as a result of climate change. The UNFCC, and the International Panel on climate Change IPCC reports also mention that the developing countries are the most vulnerable to climate change impacts because they have fewer resources to adapt socially, technologically and financially.

In the context of impact of climate change, it has been observed that it will lead to wide ranging impacts and economic costs across different sectors and regions [8]. The cause of unnatural way of climatic change is increasing

temperature [9] because humans are releasing heat trapping gasses in the earth's atmosphere called' greenhouse gasses'. The green house gasses possessing the property to trap the heat of land thus raised the earth's temperature unnatural way [10]. Tea is one of the most important beverages consumed in the world [11] and one of the oldest non alcoholic caffeine contain beverage in the world [12]. The Chinese were supposed to be the first to consume tea as medical drink, later as beverage and have been doing so far the past 300 years [13] but it was reported by Major Robert Bruce in 1823 that indigenous slopes of upper Assam. In the year 1840, tea seeds were imported from china and then commercial tea plantation were settled down in the Brahmaputra valley [14]. Among the plantation crops, tea (Camalia Sinensis) is a unique tropical crops relative to others. The uniqueness of is due to its cultivation and harvesting system. Tea is a very hardy plant and will grow in various climatic conditions and in all soils. Tea of North India grows in alluvial soil ((North Eastern Tea Garden), but it also survive finely in sedimentary but it also survive finely in sedimentary soil. Besides soil, it requires unique climatic conditions for survival. The temperature should 20 degree centigrade to 30 degree centigrade with more than 11 hours of day length. It requires high amount of rainfall 1000-1400 mm of high amount rainfall with relative humidity of 80-90%. Climate change threatened greatly tea sector because of highly dependents on stable temperature and consistent rainfall patterns. The growth of tea depends heavily on stable weather conditions, and the effects of climate change are alarming to tea industry stakeholders. There are some listed environmental variables that affect the growth of tea shoots plant and soil water deficits and rainfall and evaporation [15]. A variety of research organisations are involve in studying the impact of climate change on tea in India, such as Reseach Association of India operates Tockai Experimental station in Jorhat. The ongoing researches have seen that minimum temperature in the Assam region raised by 2 degree centigrade over the last 80 years while rainfall has decreased, caused to lower down the production overall.

Source: FAO, 2015

Fig. 1

Materials and Methods

Present study was based on secondary data. The information regarding tea plantation collected through various published resources by different organisations such as Tea Board of India. The discussion on the impact of climate on tea plantation was done with the help of news reports collected through different articles published. The simple percentage method was used in analysis of data shows by tables and charts.

Results

Fig. 2,3 and 4 shows the result of discussion that annual growth of tea production in India had shrink down noticeable amount. The sudden decrease in the annual percentage of growth of production of tea was 21.11per cent to 0.67 per cent from period of 2010 to 2014.

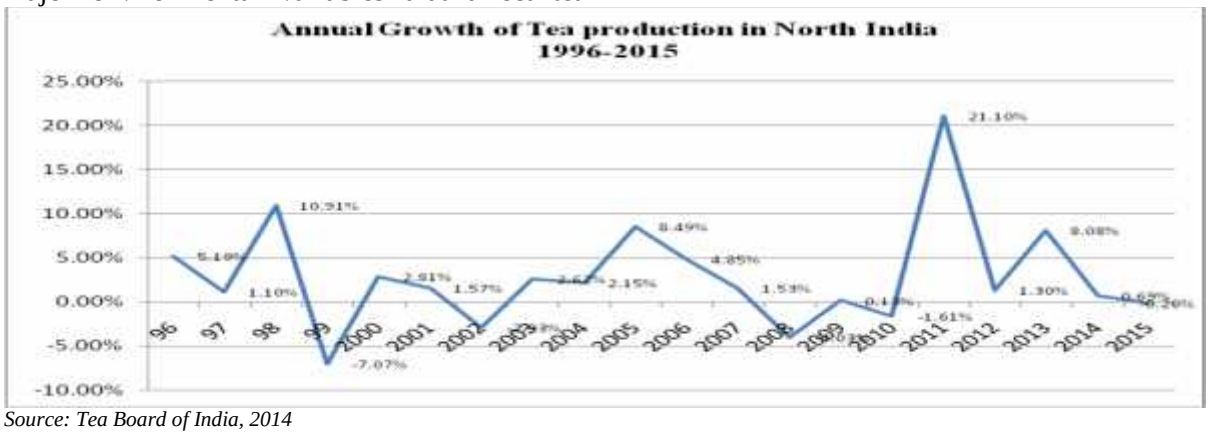
Discussion

In India, tea plantation plays a very significant role because it is the mainstay of agrarian economies of many states and union territories of the country. It is very important source of revenue for various states/UTs, and also very important contributor of foreign reserves of the country. The importance of this sector assumes deep social dimension in view of its capability to provide gainful employment, both direct as well as indirect to a large mass in remote areas of the country [1]

India is the largest producer as well as consumer of black tea in the world. It is very significant to note that about 80 per cent of total tea production consumed within the country [1]. Indian tea holds second position in the world with regard to the area under tea cultivation. India is fourth largest exporter of tea in the world after Kenya, China and Sri Lanka. The situation in India is different from the major exporting countries like Kenya and Sri Lanka because these countries have very little domestic demand and have to necessarily export more than 95 per cent to 98 per cent. In regarding of the production, India is the second largest producing country in the world with 23 per cent of total world production next to china which contributes about 32 per cent of total world production.

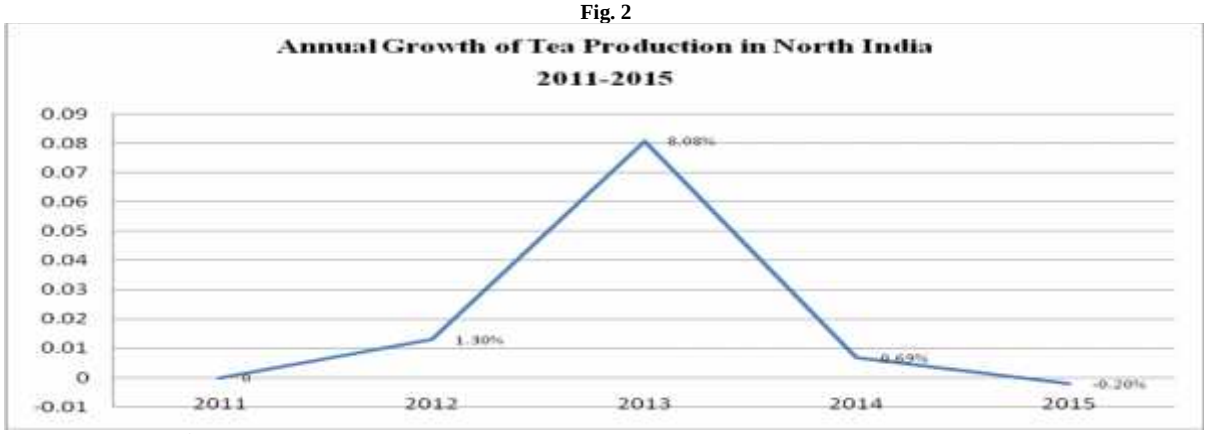
Impact of Climate Change on Tea Producing of North Indian Region: Climate change is one of the greatest challenges facing by humankind over worldwide. A change in average weather conditions or the distributions of events are mainly due to global warming. Global warming is the observed temperature increase over the last 50 years due to increase of greenhouse gas concentrations in the atmosphere [16]. Some of the major environmental variables that affect tea growth such as temperature, saturation deficit of the air, plant and soil water deficits, rainfall and evaporation [15]. The changing climate has changed the crop pattern which led to uncertainty and with this change of climate; it will be very difficult to sustain the tea industry of North Indian Region. The warming temperatures and changing rain patterns affect the production and quality of tea [17].

The ever rising temperature and irregular nature and inadequate amount and untimely rainfall cause the deterioration in quality of tea from India. As shown in the fig. 2 the total production of tea in the year 2014-15 is 1174.00 million kg. shows considerable decrease in production of preceding year that was 1208.78 million kg. in 2013-14. Where the average rainfall in the tea producing region in Assam received 50 percent less rainfall between January and March this year, Terai and Cachar regions have received 60 percent and 59 percent less rains respectively. The Doars Region has received 19 percent less rainfall over this period. Simultaneously, tea production in January to March had fallen 5.85 million kg from preceding year [18].



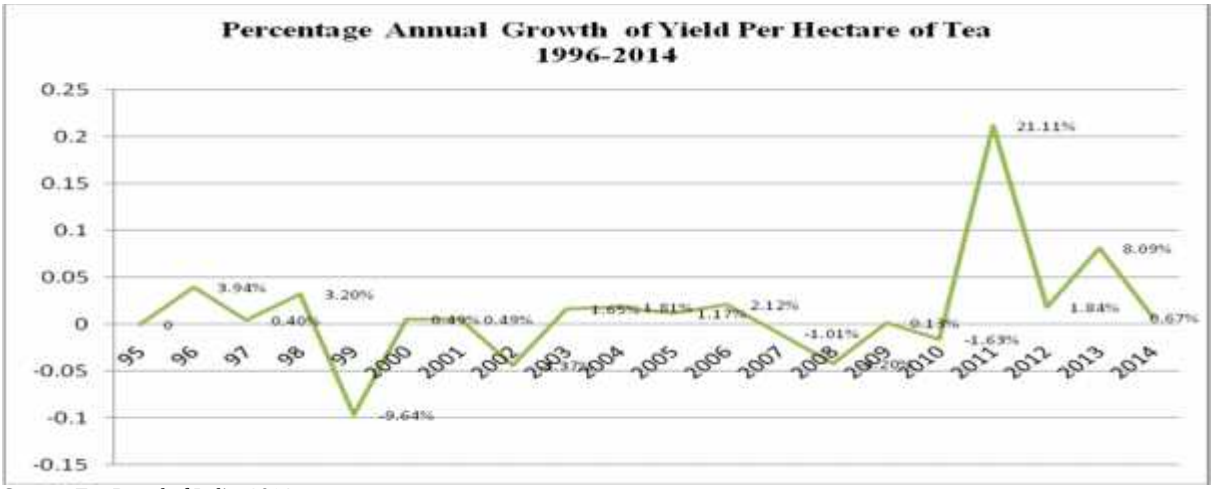
Source: Tea Board of India, 2014

Fig. 2



Source: Tea Board of India, 2014

Fig.3



Source: Tea Board of India, 2014

Fig.4

Over the past century, average land temperature in Assam has increased by 1.3 degree Celsius and rainfall is down by 20 centimetres a year. The rainfall becomes unpredicted over 30 years because of an increase in the frequency of extreme weather events and severity. It was reported in Al Jazira that as temperature upward all tea producing belts are being affected. R.M Bhagat, deputy director of the Tea Research Association added that the degree of impact varies regionally, depending on distance from equator and other local conditions [3]. The Tocklai tea experimental station is the recording centre of daily weather and tea production data for more than 100 years. The Tocklai station has recorded that minimum temperature has risen by 1.5 degree centigrade, and the annual rainfall reduced by 200 millimeters over a century and it impacts adversely on the tea production and on its taste. Assam is battered with erratic rainfall and frequent bouts and floods and droughts. Winter rainfall has become scare and distribution is fluctuating. The uncertain rainfall causes low yield of tea trees in Assam. Tea trees here previously would be high yielding until 40-50 years of age but now decline at 30-35 years. The change of climate is also conducive to pests such as tea mosquito bugs that infesting the plant's shoots. The invader eats the foliage and infects the plants with diseases and thus lowering the yield. The graph shows that lowering per cent of growth of yield [19].

Conclusion: The changing climate extremely cost more the tea production of northern Indian Region because it effects on production, taste of tea. The more prone to pest increase the production cost more. The lowering demand of tea due to lost taste suffers greatly the tea cultivators.

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