

Impact of Rainfall on Agriculture Case Study of Tamil Nadu

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Case Report

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ABSTRACT

Agriculture in India has a long history dating back over ten thousand years. Today, India is the second largest producer of farm products globally. Agricultural production is affected by a number of uncontrolled climate factors, the number one cause of rainfall (drought and flooding). The role of rain as a resource in crop production is of interest to many researchers. Rainfall plays a more important role than other farm inputs. The amount and temporal distribution of precipitation is generally the single most important determinant of annual fluctuations in national crop production levels. The study area is 1,30,058 square kilo meters between 8°5' and 13°35' north latitude and 76°15' and 80°20' east longitude. Studies depend entirely on secondary data. This study is based on graphs prepared using the analytical system, Arc GIS Software, and describes the significant areas from the study area using the statistical method.

Keywords: Rain fall; Production; Food affected area; Chi-square test

INTRODUCTION

Rainfall is the major source of water which is essential for plant growth and development. Rainfall can be excess rainfall, scanty rainfall or untimely. The total amount of rainfall in a season is not the criteria. Geographical distribution of crops growing areas in the world over regions of heavy rainfall in the relatively short period of the cropping season indicates that water supply is probably the chief limiting factor to the growth and production of crop [1]. The pattern of frequency and depth of precipitation in different month of growing season would seem to have important physiological bearing of rice plants particularly relating to yield. According to von, for instance, a 10% decrease in seasonal rainfall from the long-term average generally translates into a 4.4% decrease in the country's food production. Rainfall in much of the country is, on the other hand, often erratic and unreliable; and rainfall variability and associated droughts have historically been major causes of food shortages and famines [2]. According to, water in all its forms plays a vital role in the growth of plants and the production of all crops. It provides the medium by which food and nutrients are carried through the plant. The concept of climate and agriculture has been extensively discussed. We have all confirmed that climatic parameters (*i.e.* rainfall, sunshine, temperature, evaporation, etc) are closely interrelated in their influence on crops [3]. However, of all the climatic parameters affecting crop production and yield, moisture is the most important. Moisture is primarily gotten from rainfall which in the tropics is cyclic and fairly dependable. Agriculture and allied sectors like forestry and logging accounted for 16.6% of the GDP in 2007, employed 52% of the total workforce and despite a steady decline of its share in the GDP, is still the largest economic sector and plays a significant role in the overall socio-economic development of India. A major natural occurrence which is also indispensable in food production especially in the developing world is rainfall. More than 60 percent of staple foods are produced from rain fed agriculture which is practiced by more than 80% and 90% of global and African communities [4].

CASE PRESENTATION

Spatial unit

The study area lies between $8^{\circ}5'$ and $13^{\circ}35'$ of northern latitude and $76^{\circ}15'$ and $80^{\circ}20'$ of eastern longitude with an area of 1, 30,058 square kilometres. In this State is situated at the South Eastern extremity of the Indian Peninsula bounded on the north by Karnataka and Andhra Pradesh on the east by Bay of Bengal, on the South by the Indian ocean and on the West by Kerala State [5]. The study area lies to the South of the tropic of cancer and falls in Torrid zone. The Bay of Bengal and Indian Ocean influence the climate of the coastal region. The east coast enjoys tropical maritime climate, the central part of Tamil Nadu experiences hot and dry weather conditions whereas Chennai which lies on the coast has moderate temperature throughout the year. In these state now there are totally 32 districts. Tamil Nadu, the 11th largest state of the Indian Union, consists of areas of old rocks such as the granites, crystal and metamorphosed rocks, limestones and sandstones. The land can be broadly divided into hills, the plateau and the plains [6].

Method and methodology

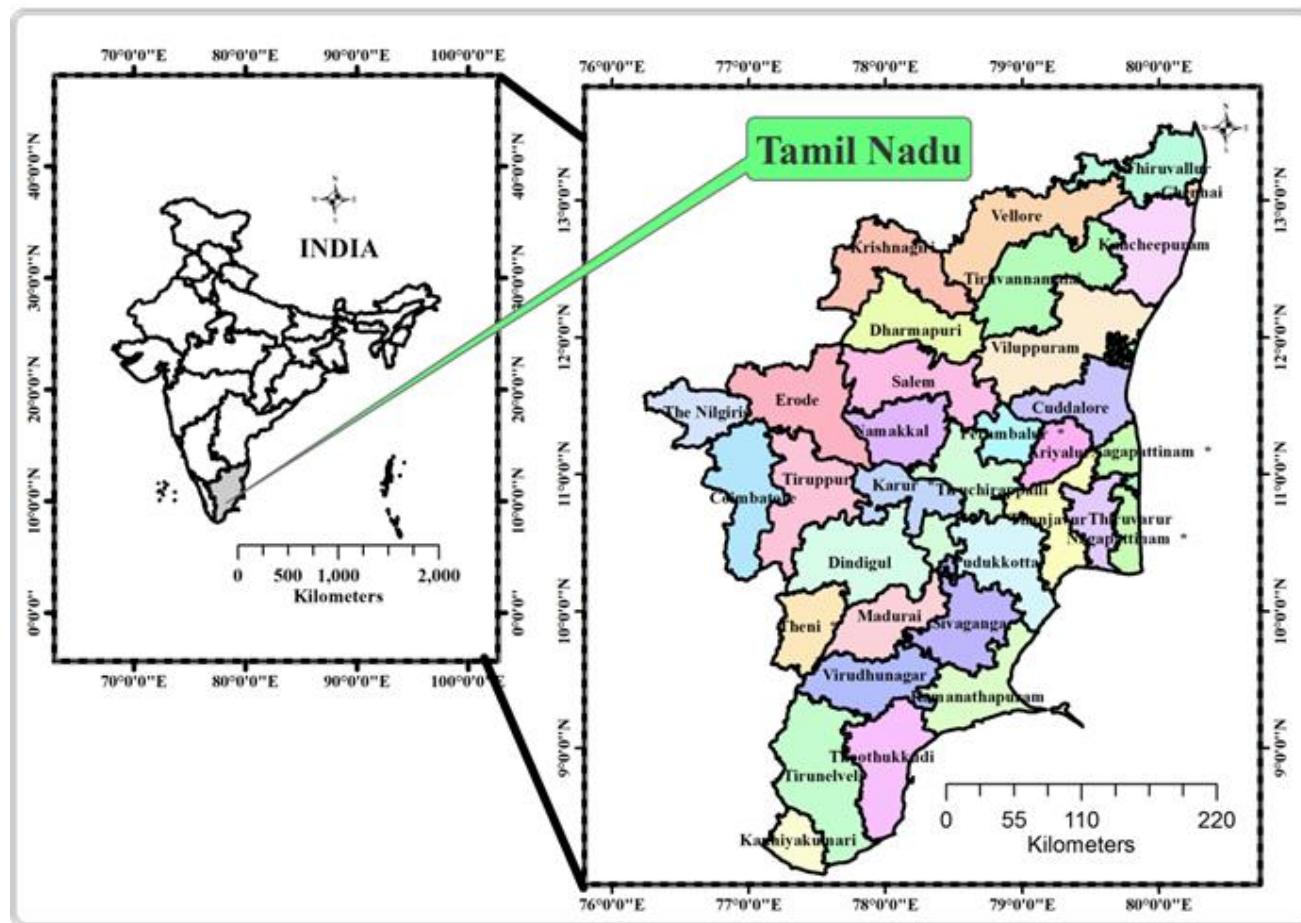
These study objectivise is to analysis distribution of rain fall, Production and flood affected area. Finally compare the rainfall, production and flood affected area from find out the impact the study [7]. The study entirely depend on secondary data, which are rainfall in centimetre data taken from the directorate of economics and Statistics,

Chennai and agriculture production area and flood affected area in square kilometre data collected from department agriculture in Chennai in Tamil Nadu volumes and other relevant government publication of for the period of 2005 to 2010 [8]. In the present study both quantitative and descriptive methods and cartographic techniques are used. And methods adopted in the present analysis are simple percentage and correlated the rainfall, production and flood affected area from during period is 2005 to 2010 have been worked out to study. These study analysis is based on the maps prepared using ArcGIS software through computer and using the SPSS software find out the significant from the study area. The Hypotheses from the study first is increase the rainfall increase the production and decrease the flood affected area. Second is increase the rainfall and decrease the production and increase the flood affected area [9].

DISCUSSION

The impact of rainfall on crop production can be related to its total seasonal amount or its intra-seasonal distribution. In the extreme case of droughts, with very low total seasonal amounts, crop production suffers the most [10]. Notes that even in wet locations rainfall variability at the daily time scale is critical to plant growth, particularly in the early part of the rainy season before soil moisture reserves have been built up. The effects of rainfall on agriculture are obvious (Figure 1) [11].

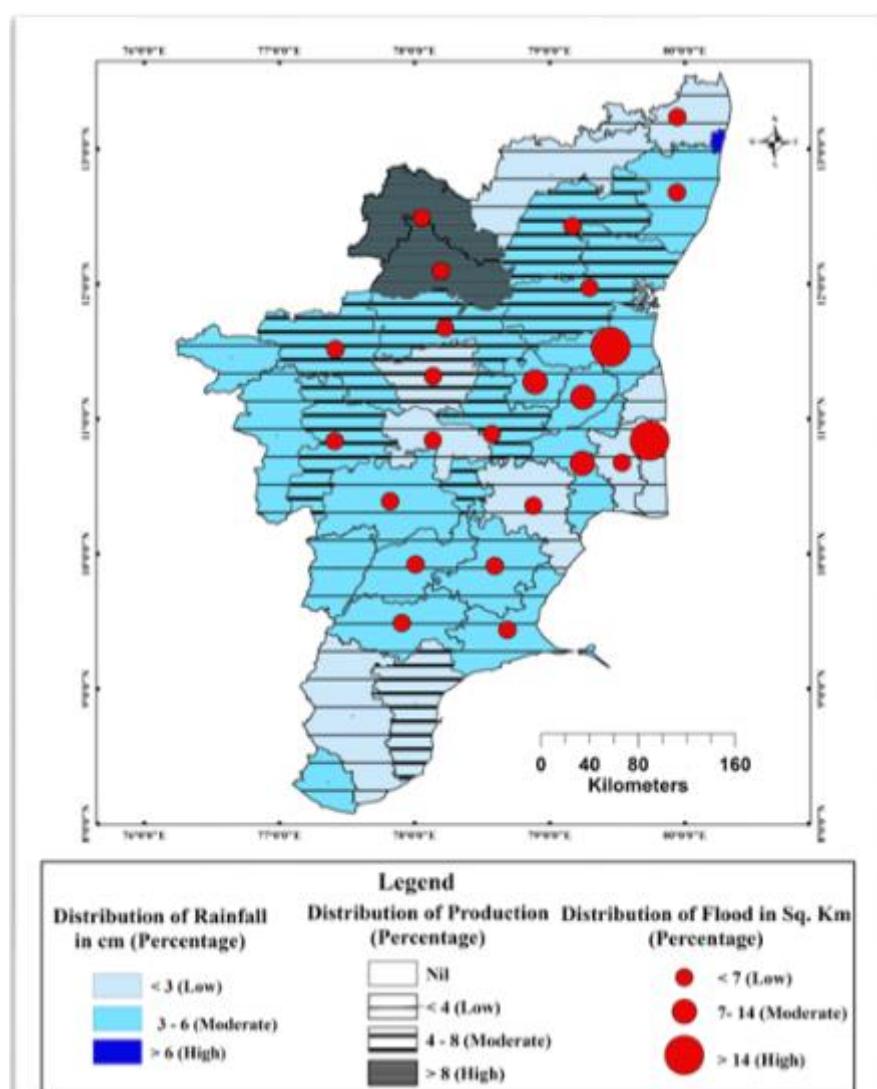
Figure 1. Base map.



Distribution and correlate the rainfall, agriculture production and flood damage area in 2005-06

Figure 2 represent the distribution and correlate the rainfall, production and flood affected area in percentage. The rain fall distribution is high in Villupuram and moderate is The Nilgiris, Chennai, Coimbatore, Krishnagirim, Dharmapuri, Cuddalore, Thanjavur, Sivaganga, Kancheepuram, Dindigul, Virudhunagar, Ramanathapuram, Salem, Erode, Tiruppur, Kanniakumari, Tiruchirappalli. Madurai and Theni districts and remaining districts is low. The agriculture crop production high in Krishnagiri and Dharmapuri and moderate in Namakkal, Salem, Villupuram, Erode, Tiruppur, Tiruchirappalli, Tuticorin and Tiruvannamalai districts and remaining districts is low. The flood affected area high in Nagapattinam, Cuddalore, Ariyalur, Perambalur, Thanjavur, Dindigul and Kancheepuram districts and low in Tiruchirappalli, Pudukkottai, Thiruvallur, Tiruvannamalai, Villupuram, Thiruvarur, Ramanathapuram, Namakkal, Karur, Madurai, Salem, Sivaganga, Virudhunagar, Krishnagiri, Dharmapuri, Erode and Tiruppur districts and remaining districts is nil. During the year 2005 to 2006 correlations between this study Cuddalore district moderate rainfall and production is low and flood affected area percentage is high and Nagapattinam district is rainfall and production is low and flood affected area is high. The Thanjavur, Ariyalur and Perambalur districts is rainfall and production is low and flood affected area is moderate. This change determine the other factors. The Krishnagiri and Dharmapuri district is rainfall and flood affected area is low and production is high. The moderate rain fall and production found in Salem, Villupuram, Erode, Tiruppur, Tiruchirappalli and Tiruvannamalai districts and low rainfall and moderate production found in Namakkal district. The Tuticorin districts low rainfall and moderate production and flood damaged area is nil. The Virudhunagar, Ramanathapuram, Madurai and Sivaganga districts is moderate rain fall and low production and remaining districts rainfall and production is low (Figure 2) [12].

Figure 2. Distribution and correlate the rainfall, agriculture production and flood damage area in 2005-06.

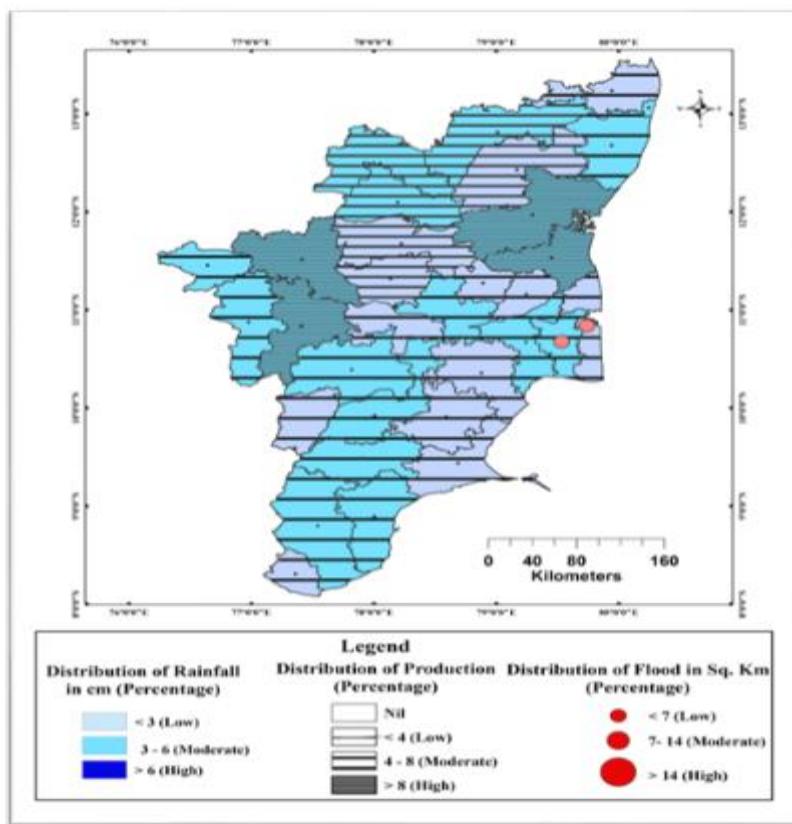


Distribution and correlate the rainfall, agriculture production and flood damage area in 2006-07

Figure 3 describe the distribution and correlate the rainfall, agriculture production and flood damage area in 2006-2007. In this study moderate rainfall found Villupuram, Chennai, Madurai, Virudhunagar, Krishnagiri, Dharmapuri, Cuddalore, The Nilgiris, Tirunelveli, Coimbatore, Dindigul, Thanjavur, Tiruchirappalli, Kancheepuram, Tuticorin, Erode, Tiruppur, Thiruvarur and Vellore districts and remaining districts is low. The agriculture production high in Villupuram, Erode, Tiruppur and Cuddalore districts and moderate distribution found in Namakkal, Krishnagiri, Dharmapuri, Tiruvannamalai, Vellore and Salem districts and remaining districts is low expected from Chennai. The distribution of flood affected area in moderate in Thiruvarur and Nagapattinam districts and remaining districts is nil. The correlated from study is high production and low rainfall found in Villupuram, Erode, Tiruppur and Cuddalore districts and moderate rainfall and moderate production found in Dharmapuri, Krishnagiri and Vellore districts. The low rainfall and moderate production found in Namakkal, Tiruvannamalai and Salem districts and the low rainfall and low production found in Sivaganga, Karur, Kanniakumari, Tiruvannamalai, Ariyalur, Perambalur, Nagapattinam, Salem, Ramanathapuram, Theni, Namakkal, Thiruvallur and Pudukkottai districts and remaining districts is moderate rainfall and low production. The low rainfall and low production and low flood affected area in

Nagapattinam districts and the Thiruvarur districts moderate rainfall and low production and flood affected area (Figure 3).

Figure 3. Distribution and correlate the rainfall, agriculture production and flood damage area in 2006-2007.

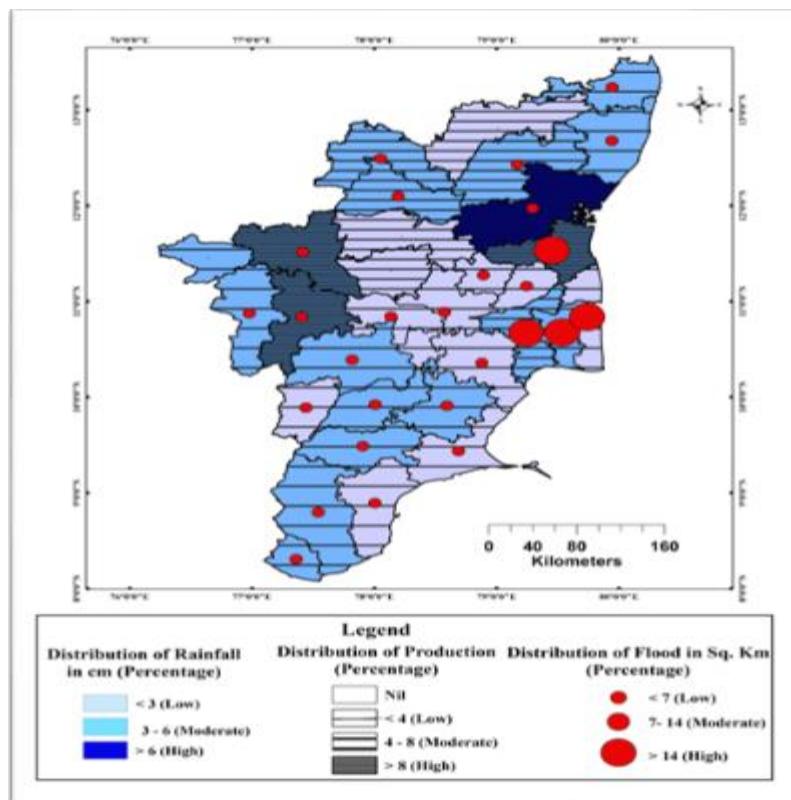


Distribution and correlate the rainfall, agriculture production and flood damage area in 2007-2008

Figure 4 represent the distribution and correlate the rainfall, agriculture production and flood damage Area in 2007-08. The distribution of rainfall high in Villupuram district and moderate rainfall found in Madurai, The Nilgiris, Thanjavur, Krishnagiri, Dharmapuri, Cuddalore, Dindigul, Chennai, Coimbatore, Virudhunagar, Kancheepuram, Tirunelveli, Erode, Tiruppur, Thiruvallur, Tiruvannamalai, Sivaganga, Thiruvarur, Kanniakumari districts and remaining districts is low. The agriculture production high in Villupuram, Erode, Tiruppur and Cuddalore districts and moderate production found in Krishnagiri, Dharmapuri, Tiruvannamalai, Namakkal, Vellore, Salem, Thanjavur, Tiruchirappalli, Ariyalur and Perambalur districts and remaining districts is low expected in Chennai district. The distribution of flood affected area high in Thiruvarur, Nagapattinam, Thanjavur and Cuddalore districts and low area affected in Tiruchirappalli, Tirunelveli, Tuticorin, Kancheepuram, Pudukkottai, Ariyalur, Ramanathapuram, Karur, Perambalur, Virudhunagar, Kanniakumari, Thiruvallur, Sivaganga, Madurai, Dindigul, Theni, Villupuram, Tiruppur, Erode, Tiruvannamalai, Dharmapuri and Krishnagiri districts and remaining districts is nil. The correlated between rainfall, production and flood affected area percentage from the study is moderate rainfall and high production also high flood affected area found in Cuddalore district and moderate rainfall and low production also include high flood affected area found in Tiruvarur and Thanjavur districts, it is mouth of the Cauvery river. The moderate rainfall and production and flood affected area low in Dharmapuri, Krishnagiri and Tiruvannamalai districts. The moderate rainfall and low production and flood affected area located in Tiruvallur, Kancheepuram, Dindigul, Madurai,

Viruthunager, Tirunelveli, kaniyakumari and sivagangai districts. Rainfall and production and flood affected area low is found in tuticorin, ramanathapuram, Pudukkottai, Trichy, Ariyalur, Perambalur and Karur districts remaining districts is low rainfall and production and flood damage area is nil (Figure 4).

Figure 4. Distribution and correlate the rainfall, agriculture production and flood damage area in 2007-2008.

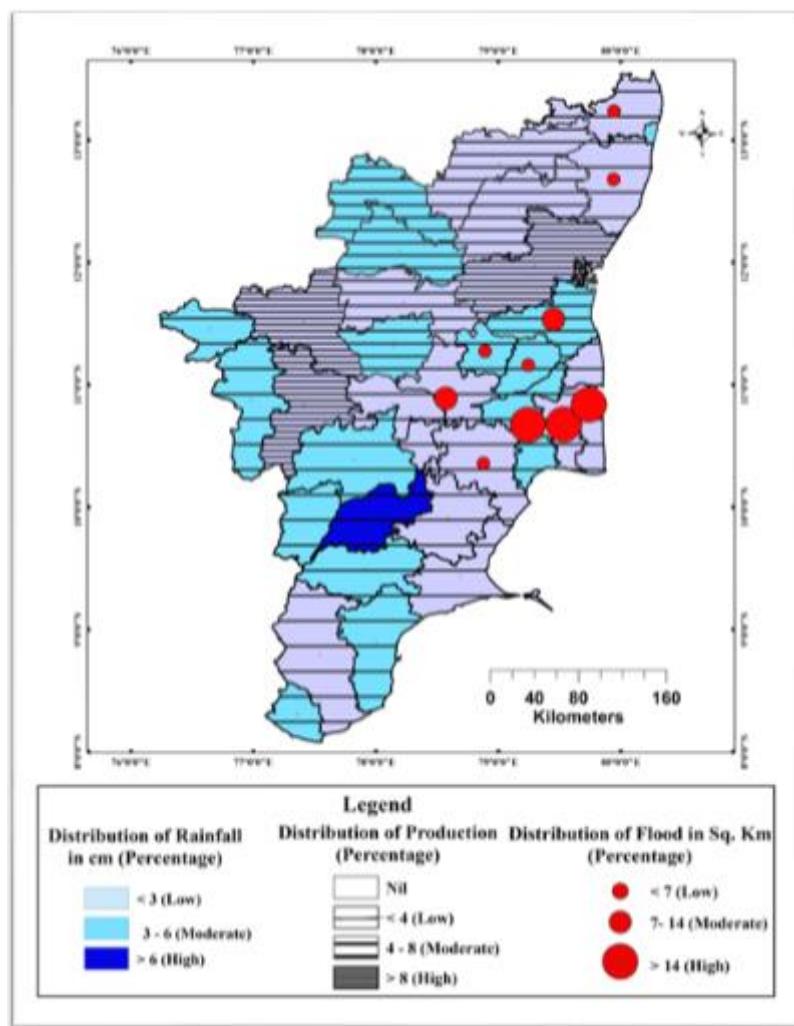


Distribution and correlate the rainfall, agriculture production and flood damage area in 2008-2009

Figure 5 describe correlate the rainfall, agriculture production and flood damage area in 2008-2009. The distribution of rainfall percentage is high from Madurai district and moderate in Ariyalur, Perambalur, The Nilgiris, Theni, Krishnagiri, Dharmapuri, Thanjavur, Virudhunagar, Coimbatore, Chennai, Cuddalore, Namakkal, Tuticorin, Dindigul and Kanniayakumari districts and remaining districts is low. The distribution of crop production high in Villupuram, Erode and Tiruppur districts and moderate in Namakkal, Cuddalore, Krishnagiri, Dharmapuri, Tiruvannamalai, Salem and Vellore districts and remaining districts is low. The distribution of flood affected area high In Thiruvarur, Nagapattinam and Thanjavur districts and moderate in Cuddalore and Tiruchirappalli districts and low in Pudukkottai, Ariyalur, Perambalur, Thiruvallur and Kancheepuram districts and remaining districts is nil. The correlated in rainfall, production and flood affected area percentage from the study is moderate rainfall, production and flood affected area in Cuddalore districts. The Nagapattinam and Tiruvarur district found rain fall and production is low and flood affected area is high it is due to other factors. The Thanjavur district is a moderate rainfall and low production and flood affected area is high. Tiruchirappalli district is low rainfall and low production and moderate flood affected area. The rainfall, production and flood affected area is low in Tiruvallur, Kancheepuram and Pudukkottai district. The rainfall is moderate and production and flood affected area low in Ariyalur and Perambalur districts. The high rainfall and low production and flood affected area nil in Madurai

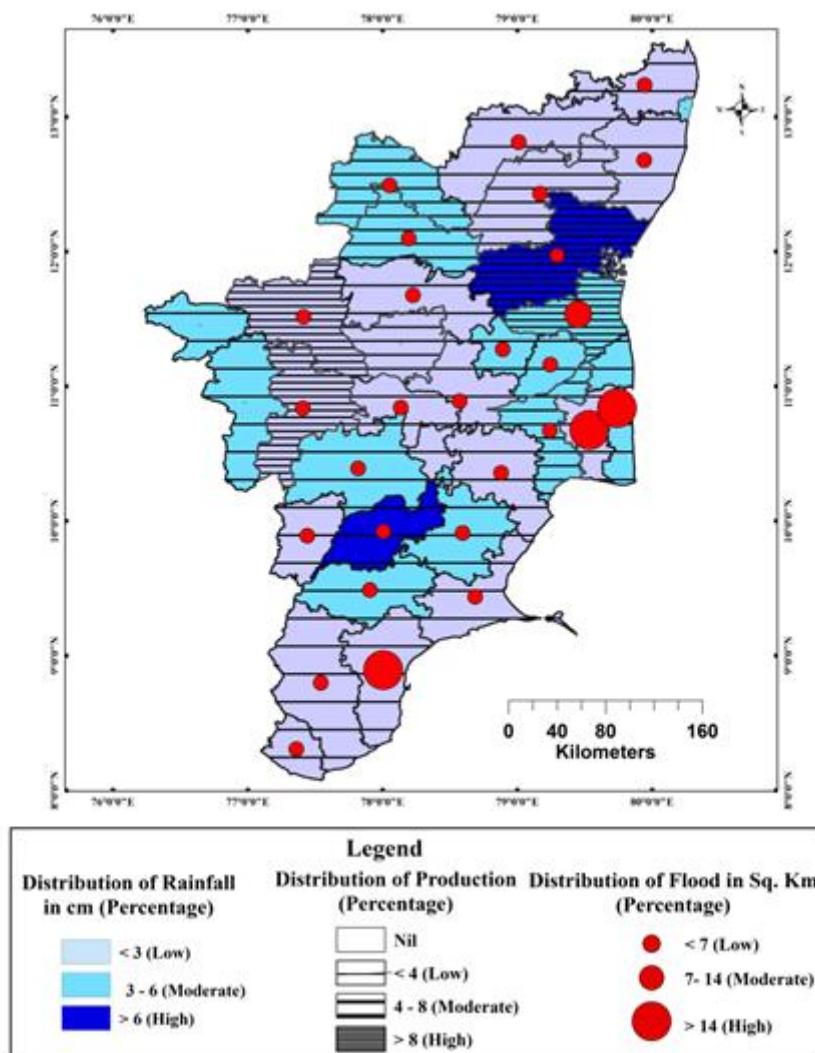
district. The rainfall and production is moderate found in Dharmapuri, Krishnagiri and Namakkal districts. The low rainfall and high production and flood affected area nil in Tirupur, Erode and Cuddalore districts. The moderate rainfall and low production and flood affected area is nil found in the nilagirs, Coimbatore, Dindigul, theni, Tuticorin and kaniyakumari districts. The Tirunelveli, ramanathapuram and sivagangai districts found in low rainfall and production and flood affected area is nil (Figure 5).

Figure 5. Distribution and correlate the rainfall, agriculture production and flood damage area in 2008-09.



Distribution and correlate the rainfall, agriculture production and flood damage area in 2009-2010

Figure 6 explain the distribution and correlate the rainfall, agriculture production and flood damage area in percentages during the 2009-2010. The distribution of rainfall high in Madurai and Villupuram districts and moderate in Ariyalur, Perambalur, The Nilgiris, Krishnagiri, Dharmapuri, Thanjavur, Sivaganga, Chennai, Nagapattinam, Coimbatore, Virudhunagar, Dindigul and Cuddalore districts and remaining districts is low. The agriculture crop production area percentage high in Villupuram, Erode, Tiruppur and Cuddalore districts and remaining districts is low expected in Chennai. The flood affected area in percentage is high in Thiruvarur, Nagapattinam and Tuticorin districts and moderate in Cuddalore district and remaining districts is low expected from Namakkal, the Nilgiris, Coimbatore and Chennai districts (Figure 6) .

Figure 6. Distribution and correlate the rainfall, agriculture production and flood damage area in 2009-10.

The correlation between rainfall, production and flood affected area in Tamil Nadu

Table 1 represent the correlation between rainfall and production and flood affected area in Tamil Nadu 2005-2010. The correction between rainfall and production is negative in 2005 to 2008 and significant level is low positive in 2008-2009 and 2009-2010 is null significant. The relationship between rainfall and flood affected area correlation significant level is low positive in 2005 to 2010. In this sum explain the relationship between rainfall and production is not highly significant and rainfall and flood affected area significant level is low positive (0.2-0.4) (Table 1).

Table 1. The correlation between rainfall, production and flood affected area.

Period	Rainfall	Production	Flood affected
2005-2006	-	-0.068	0.3
2006-2007		-0.084	0.05
2007-2008		-0.026	0.34
2008-2009		0.153	0.38
2009-2010		0.003	0.2

CONCLUSION

Because of the high dependence of agricultural production in the present study areas, the amount of rainfall and its variability are important for livelihoods. The world is under pressure from its rapid human population growth and global warming, both of which significantly affect the agricultural sector and cause food insecurity. The study shows that from 2005 to 2010, the coastal areas of Cuddalore, Nagapattinam, Thiruvarur and Nagapattinam districts were the most affected by low rainfall and floods. During the period from 2005 to 2010. Namakkal, Krishnagiri, Dharmapuri, Thiruvannamalai, Vellore and Salem districts had low rainfall and moderate production and the area affected by floods was low; this is good soil, terrain and timely irrigation and technological development. The correlation significant level also explain the rainfall and production relationship is negative and rainfall and flood affected area relationship is low positive correlation. In the present study area, rainfall is not a major cause of flooding, it is a small factor. Agricultural production and rainfall are not the main causes, it is one cause and other factors such as soil, terrain, irrigation facilities and technical machinery also decided the impact of agriculture and production.

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