GLOBE SOCIETY OF NALANDA COLLEGE

Study on Deviation of Annual Rainfall Pattern in Colombo District, Sri Lanka

---

GLOBE PROJECT

TEACHER IN CHARGE
Mrs. Upeksha Abeysekara

PROJECT BY
Seneviratne AL, Munasinghe CS, Liyanage DT

CERTIFICATION

This is to certify that the GLOBE SOCIETY of Nalanda College has conducted this study under the guidance of Mrs. Upeksha Abeysekara (Teacher in charge of the GLOBE SOCIETY) up to the standards of proper Scientific Research. The analyzed results obtained through this study which is present in this report are precise and accurate.

.....	.....	.....
Ms. Damayanthi Balasooriya	Mr. J.H.M.W. Ranjith	Mrs. Upeksha Abeysekara
(Country Coordinator, GLOBE)	(Principal, Nalanda College)	(Teacher in charge)

B. L. D. BALASURIYA
Director of Education (Agriculture)
Agriculture and Environmental Studies Branch
Ministry of Education
"Isurupaya"
Battaramulla.

J. H. M. W. RANJITH
Principal
Nalanda College,
Colombo 10.

1.0 ABSTRACT

Rainfall is one of the influencing factors for human activities which is defined as the amount of water falling in rain within a given time and area, usually expressed as a hypothetical depth of coverage. The impact of rainfall is not limited to agricultural based regions but also to industrialized urban areas. The rainfall received in any region can vary with physical factors as well as human interactions. The physical factors that can cause such variation could include micro-climatic phenomenon or global changes such as photochemical smog and global warming. The results obtained through observation by the GLOBE SOCIETY of our school clearly indicates that there are significant changes in the rainfall pattern of Colombo district which belongs to the wet zone of Sri Lanka. Annually Sri Lanka receives different rainfall types, which are Convectional rainfall, Monsoonal rainfall and Expressional rainfall. As a result of abrupt changes in nature the rainfall patterns of Colombo has been affected and this study focuses on these deviations and the changes that may occur on the crop calendar due to this. The cultivation in Sri Lanka is carried out in the two main seasons 'Yala' and 'Maha'. According to the typical rainfall patterns and the crop calendar the highest rainfall in Colombo (wet zone) is expected in the months May and October. Yet our study concludes that these patterns have changed over the past decade (2005 – 2015). Through this study we are focusing on informing the general public and the cultivators about the deviation in typical rainfall pattern in Colombo district.

2.0 TABLE OF CONTENT

3.0 ACKNOWLEDGMENTS

Our sincere thanks goes to,

- Mr. Ranjith Jayasundara – Principal of Nalanda College
- Ms. Damayanthi Balasooriya – Country Coordinator of GLOBE
  Director (Agriculture) Ministry of Education
  Sri Lanka
- Mrs. Upeksha Abeysekara – Teacher in Charge
- Dr.(Mrs.) K.V.T Gunewardena – Doctor, Mulleriyawa Hospital
- Dr.(Mr.) S.P Senevirathne – Consultant (Doctor) Wathupitiwala
- Mrs. WMR Lalani – Superintendent of Audit, Auditor Generals Department
- Mr. W Munasinghe – General Manager, Zenith Fashion
- Mrs. LRP De Silva – Gemologist, Lanka Gemological Institute
- Mr. KLD Dayasagara – Gemologist, Gem Authority
- All the Members in the GLOBE SOCIETY of Nalanda College

4.0 PROJECT TEAM

Name: Chanu Munasinghe

Gender: Male

Date of Birth: 13th March 1998

School: Nalanda College

Education: GCE (A/L)

Name: Asvin Senevirathne

Gender: Male

Date of Birth: 26th April 1998

School: Nalanda College

Education: GCE (A/L)

Name: Dilina Liyanage

Gender: Male

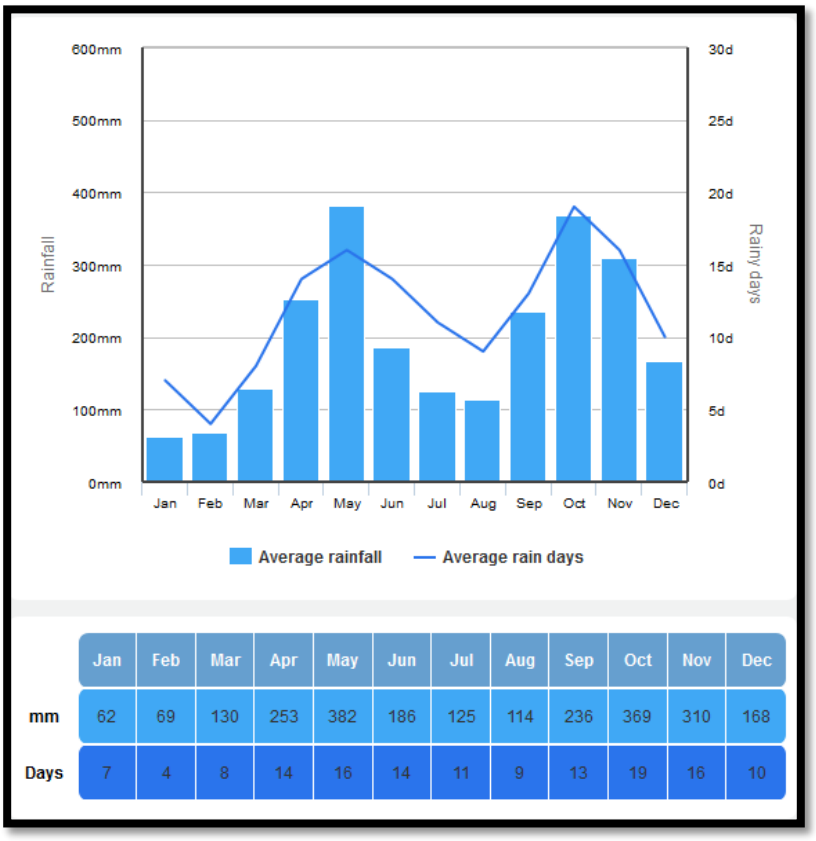
Date of Birth: 24th July 1998

School: Nalanda College

Education: GCE (A/L)

5.0 BACKGROUND INFORMATION

Colombo which belongs to the wet zone of Sri Lanka receives over 2500mm of rainfall per annum. According to the past studies conducted on rainfall the highest is received in the months May and October. And the cultivators design their crop cultivation patterns according to these data.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
mm	62	69	130	253	382	186	125	114	236	369	310	168
Days	7	4	8	14	16	14	11	9	13	19	16	10

Figure 01 - Annual rainfall pattern of Colombo district according to past studies.

Colombo receives rainfall from all three types of rainfall in Sri Lanka namely, Convectional, Monsoonal and Expressional. The monsoonal rainfall is categorized into 4 main types according to the direction of wind flow.

- **First Inter-Monsoon Season (March – April)**
- **Southwest Monsoon Season (May – September)**
- **Second Inter-Monsoon Season (October – November)**
- **Northeast Monsoon Season (December – February)**

First Inter-Monsoon Season (March – April)

Warm and uncomfortable conditions, with thunderstorm-type rain, particularly during the afternoon or evening, are the typical weather conditions during this season. The distribution of rainfall during this period shows that the entire South-western sector at the hill country receiving 250 mm of rainfall, with localize area on the South-western slops experiencing rainfall in excess of 700 mm (Keragala 771 mm). Over most parts of the island, the amount of rainfall various between 100 and 250 mm, the notable exception being the Northern Jaffna Peninsula (Jaffna- 78 mm, Elephant pass- 83 mm).

Southwest Monsoon Season (May – September)

Windy weather during this monsoon eases off the warmth that prevailed during the 1st Inter monsoon season. Southwest monsoon rains are experience at any times of the day and night, sometimes intermittently mainly in the Southwestern part of the country. Amount of rainfall during this season varies from about 100 mm to over 3000 mm. The highest rainfall received in the mid-elevations of the western slops (Ginigathhena- 3267 mm, Watawala- 3252 mm, Norton- 3121 mm). Rainfall decreases rapidly from these maximum regions towards the higher elevation, and in Nuwara-eliya drops to 853 mm. The variation towards the Southwestern coastal area is less rapid, with the Southwestern coastal belt experiencing between 1000 mm to 1600 mm of rain during this 5 month long period. Lowest figures are recorded from Northern and Southeastern regions.

Second Inter-Monsoon Season (October – November)

The thunderstorm-type of rain, particularly during the afternoon or evening, is the typical climate during this season. But unlike in the Inter-monsoon season, the influence of weather system like depression and cyclones in the Bay of Bengal is common during the second Inter-monsoon season. Under such conditions, the whole country experiences strong winds with wide spread rain, sometimes leading to floods and landslides. The second Inter-monsoon period of October – November is the period with the most evenly balanced distribution of rainfall over Sri Lanka. Almost the entire island receives in excess of 400 mm of rain during this season, with the Southwestern slops receiving higher rainfall in the range 750mm to 1200 mm (Weweltalawa Estate in Yatiyantota recording 1219 mm)

Northeast Monsoon Season (December – February)

The dry and cold wind blowing from the Indian land-mass will establish a comparatively cool, but dry weather over many parts making the surrounding pleasant and comfortable weather except for some rather cold morning hours. Cloud-free skies provide days full of sunshine and pleasant and cool night. During this period, the highest rainfall figures are recorded in the North, Eastern slopes of the hill country and the Eastern slopes of the Knuckles/Rangala range. The maximum rainfall is experience at Kobonella estate (1281 mm), and the minimum is in the Western coastal area around Puttalam (Chilaw- 177 mm) during this period.

ANNUAL RAINFALL IN SRI LANKA

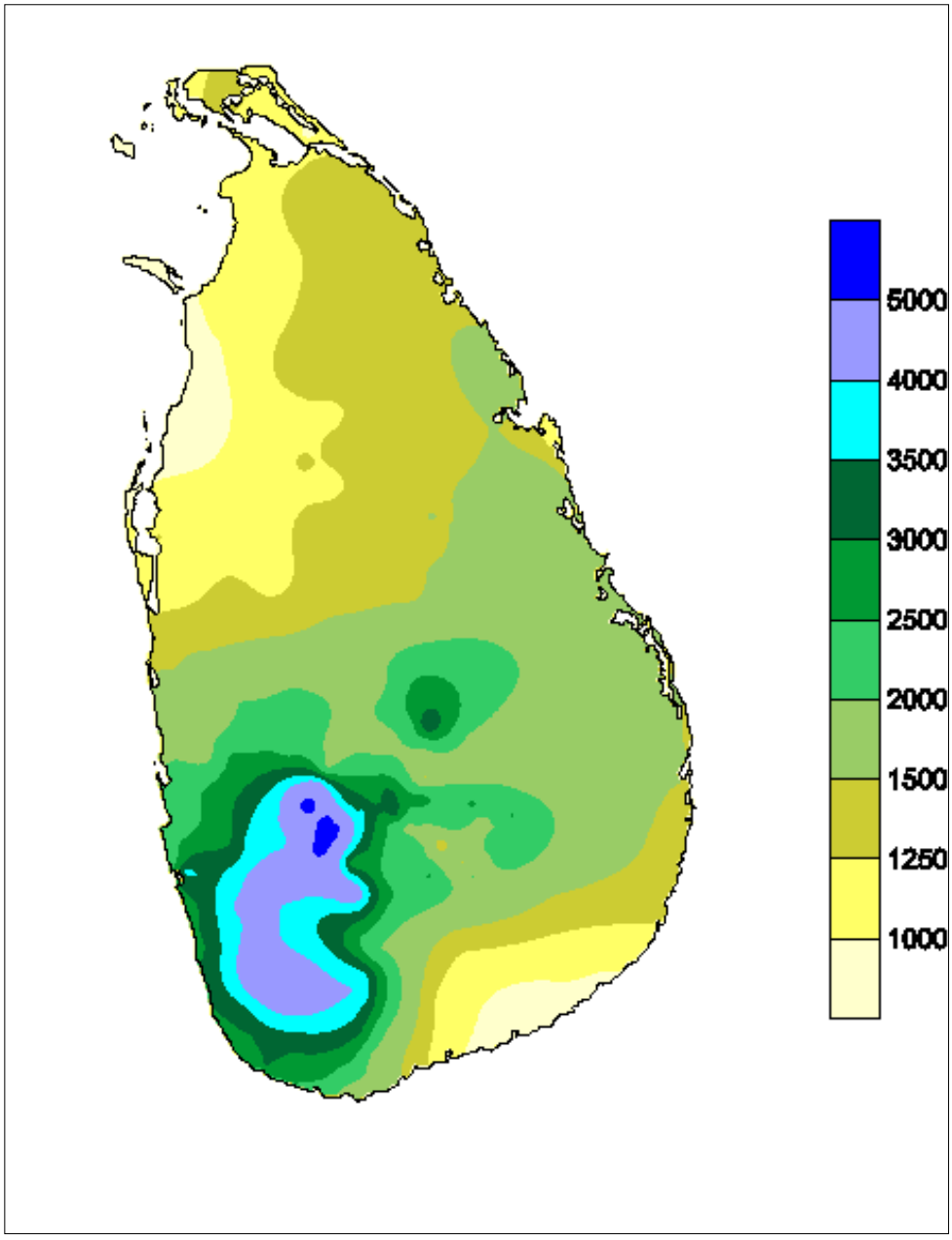


Figure 02 – Annual Rainfall in Sri Lanka. (Image source: http://www.mysrilankaholidays.com/cultural-triangle.html)

5.1 LITERATURE SURVEY

According to the studies conducted by us to find out the latest rainfall patterns we reached to the conclusion that the existing rainfall pattern has not been properly updated even though there are considerable amount of deviations from the typical pattern.

Due to these reasons, this study is conducted with the intension of finding the precise rainfall pattern in Colombo district in order to inform the general public.

5.2 HYPOTHESIS

As a result of changes that has taken place in the environment the usual pattern of rainfall has deviated.

5.3 OBJECTIVES

- Obtaining the deviations in the existing rainfall pattern.
- Developing the new rainfall pattern for Colombo district using the rainfall data in the last decade.
- Informing the cultivators about the new rainfall pattern for them to design their cultivations accordingly.

6.0 MATERIALS AND METHODS

Rain gauge was used in order to obtain the rainfall data which was needed for the research.

Rainfall data was obtained by us and the GLOBE SOCIETY of our school

This was done by the GLOBE SOCIETY for 10 consecutive years under the guidance of the teacher in charge of the club Mrs. Upeksha Abeysekara.

After collecting the data for the past ten years using the data bank of the GLOBE SOCIETY we analyzed the data to calculated the averages of the rainfall and thereby identified the significant deviations from the existing pattern of rainfall.

Using the calculated data we were able to develop the new pattern of rainfall for Colombo district quantitatively.

Then the graphical representation for the rainfall results for the past decade was designed afterwards average wisely.

7.0 RESULTS

7.1 AVERAGE RAINFALL IN YEARS 2005-2015

Average Rainfall in Years

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
January	165	221	105	101	59	105	129	85	42	23	24
February	53	127	16	197	27	29	91	118	148	21	106
March	179	184	58	304	249	136	115	21	60	103	168
April	277	127	441	581	305	418	417	313	143	186	228
May	332	250	313	313	208	650	133	96	291	105	184
June	274	230	125	331	246	247	59	93	237	115	139
July	141	98	153	275	143	158	51	7	184	31	17
August	71	330	246	178	142	62	141	166	20	242	53
September	151	169	219	175	248	359	36	159	209	239	435
October	548	694	385	511	256	246	175	328	233	287	315
November	833	562	255	266	409	605	322	191	167	427	331
December	213	113	145	144	219	272	156	157	30	362	312
Total Rainfall	3237	3105	2461	3376	2511	3287	1825	1734	1764	2141	2312
Rainfall per month	269.75	258.75	205.08	281.33	209.25	273.91	152.08	144.5	147	178.41	192.67

Figure 03 – Average rainfall in years 2005-2015

(Data were collected from Nalanda College Globe Project weather data library)

7.2 MONTHLY AVERAGE OF RAINFALL

Month	Average Rainfall
January	96.27272727
February	84.81818182
March	143.3636364
April	312.3636364
May	261.3636364
June	190.5454545
July	114.3636364
August	150.0909091
September	218.0909091
October	361.6363636
November	397.0909091
December	193
Total Rainfall	**2523**
Rainfall per month	**210.25**

Figure 04 – Monthly Average rainfall

(Data were collected from Nalanda College Globe Data Library)

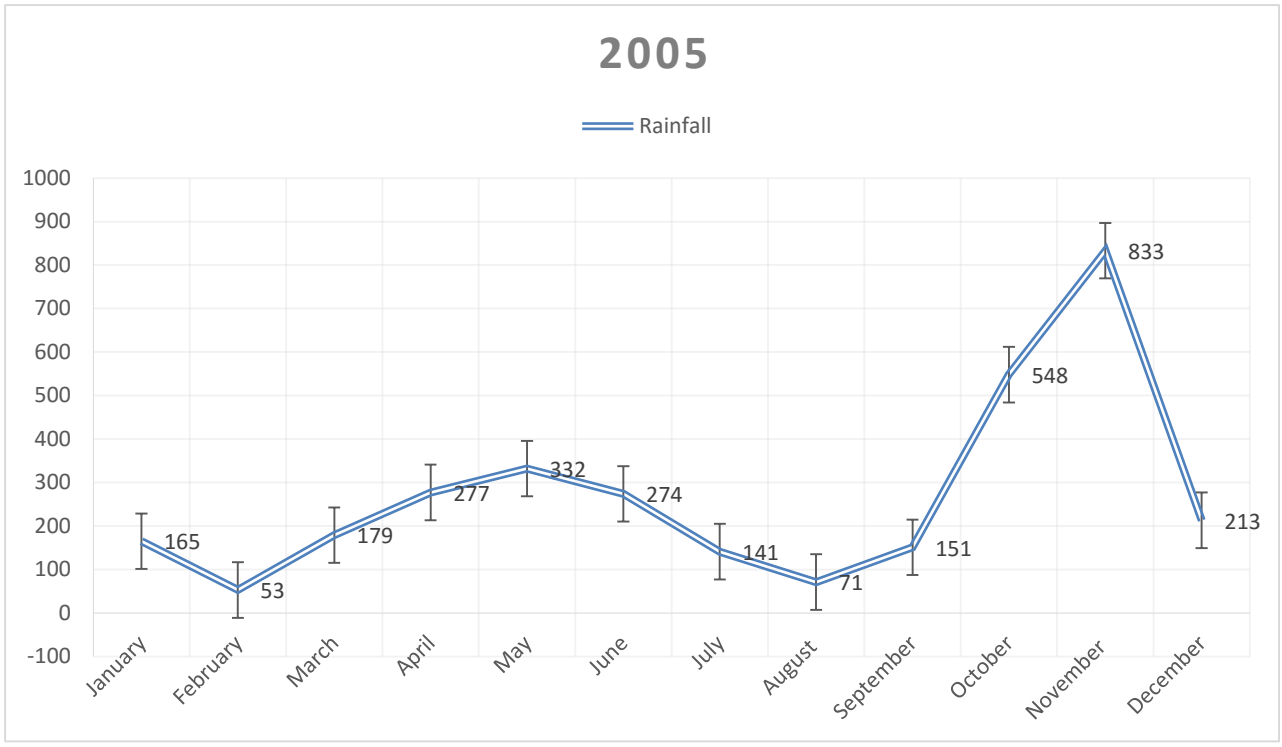


Figure 05 – Average rainfall in 2005

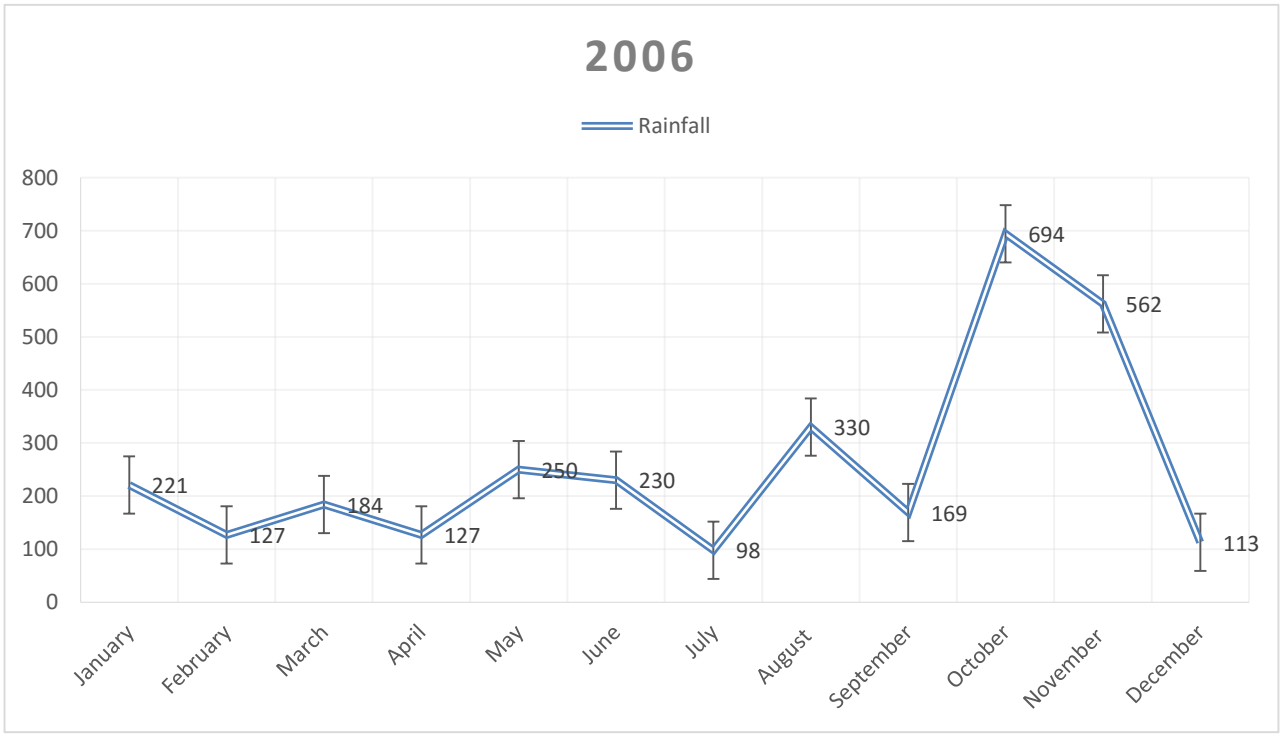


Figure 06 – Average rainfall in 2006

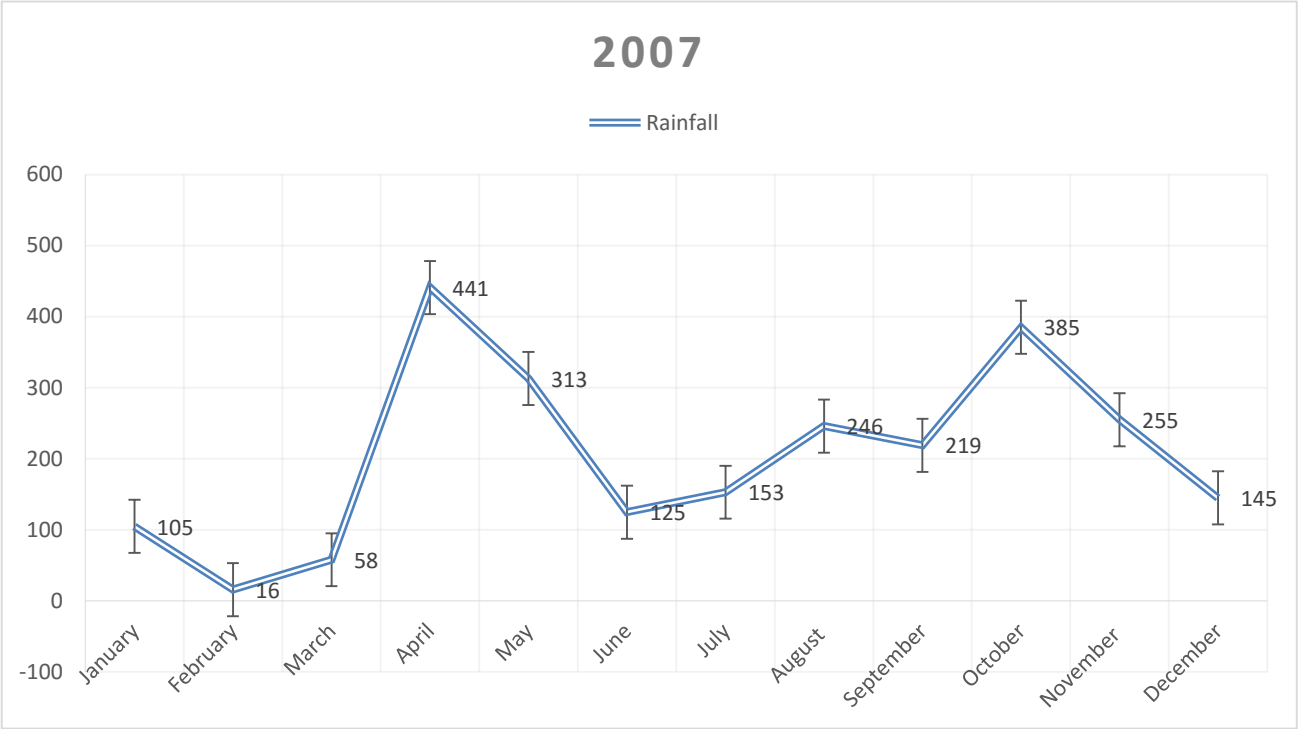


Figure 07 – Average rainfall in 2007

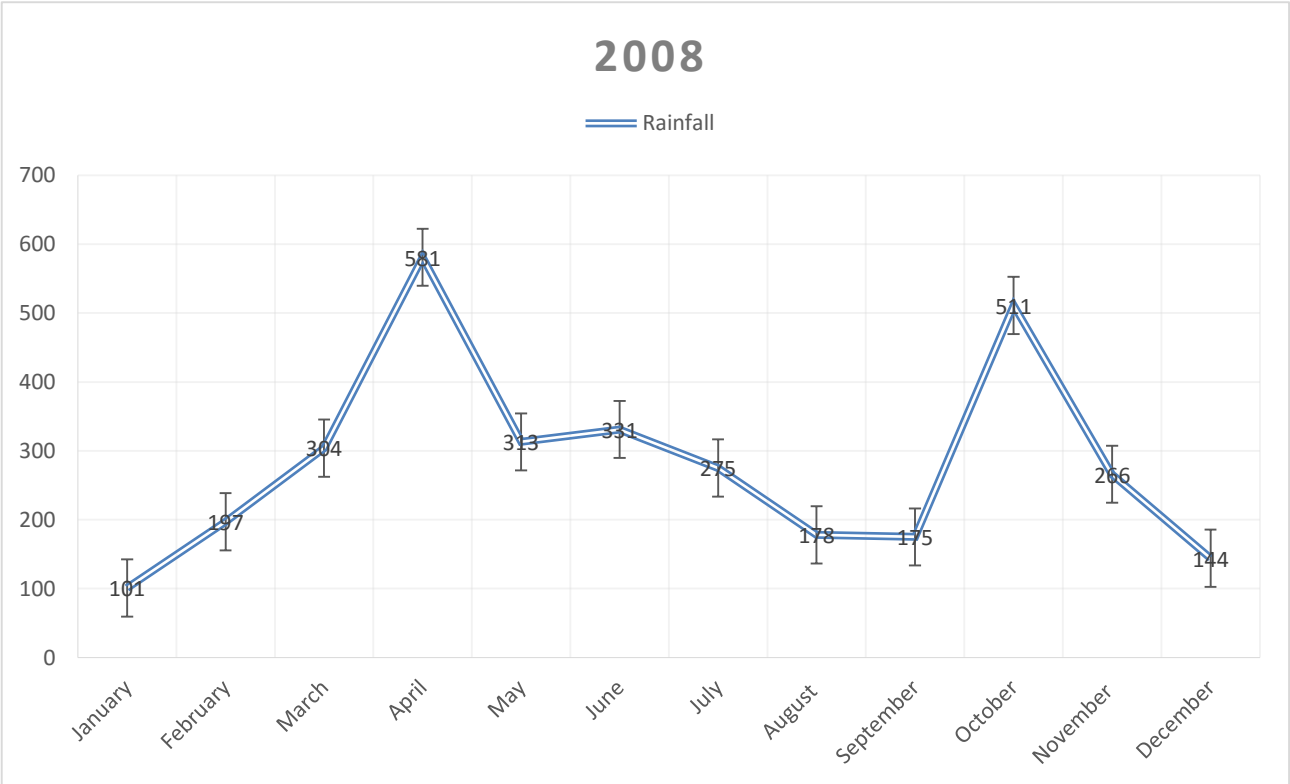


Figure 08 – Average rainfall in 2008

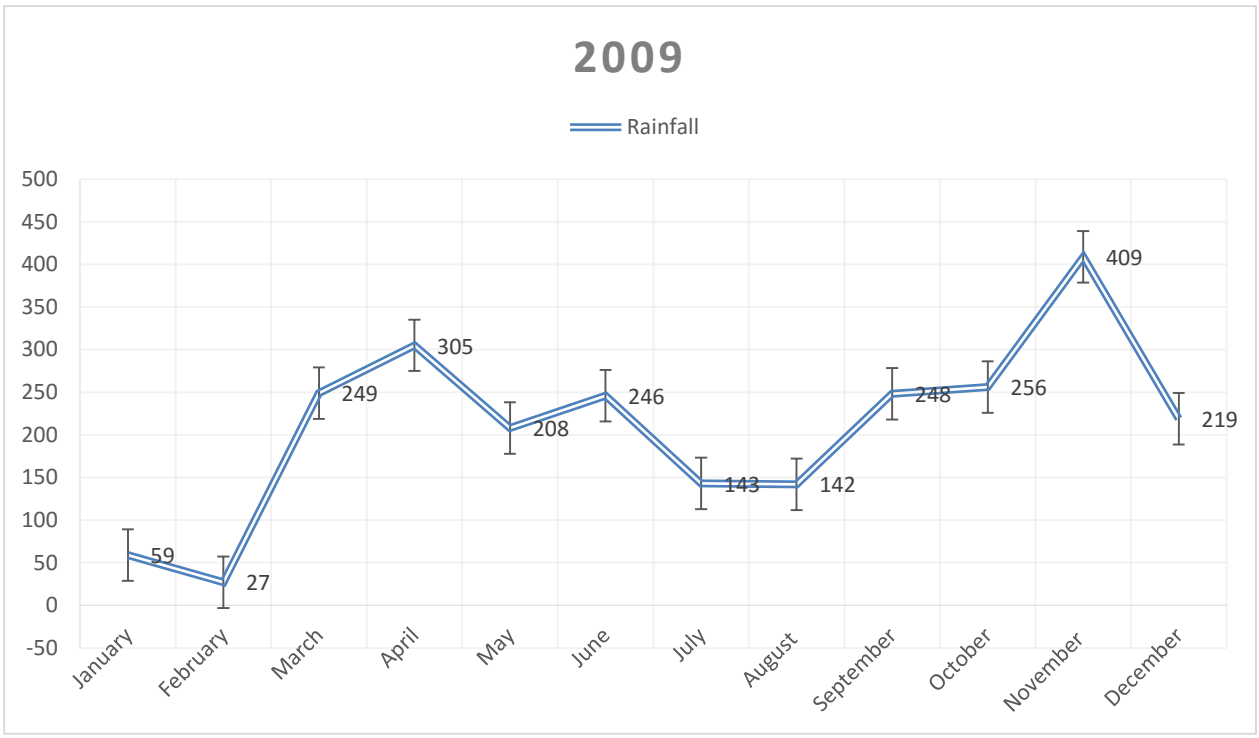


Figure 09 – Average rainfall in 2009

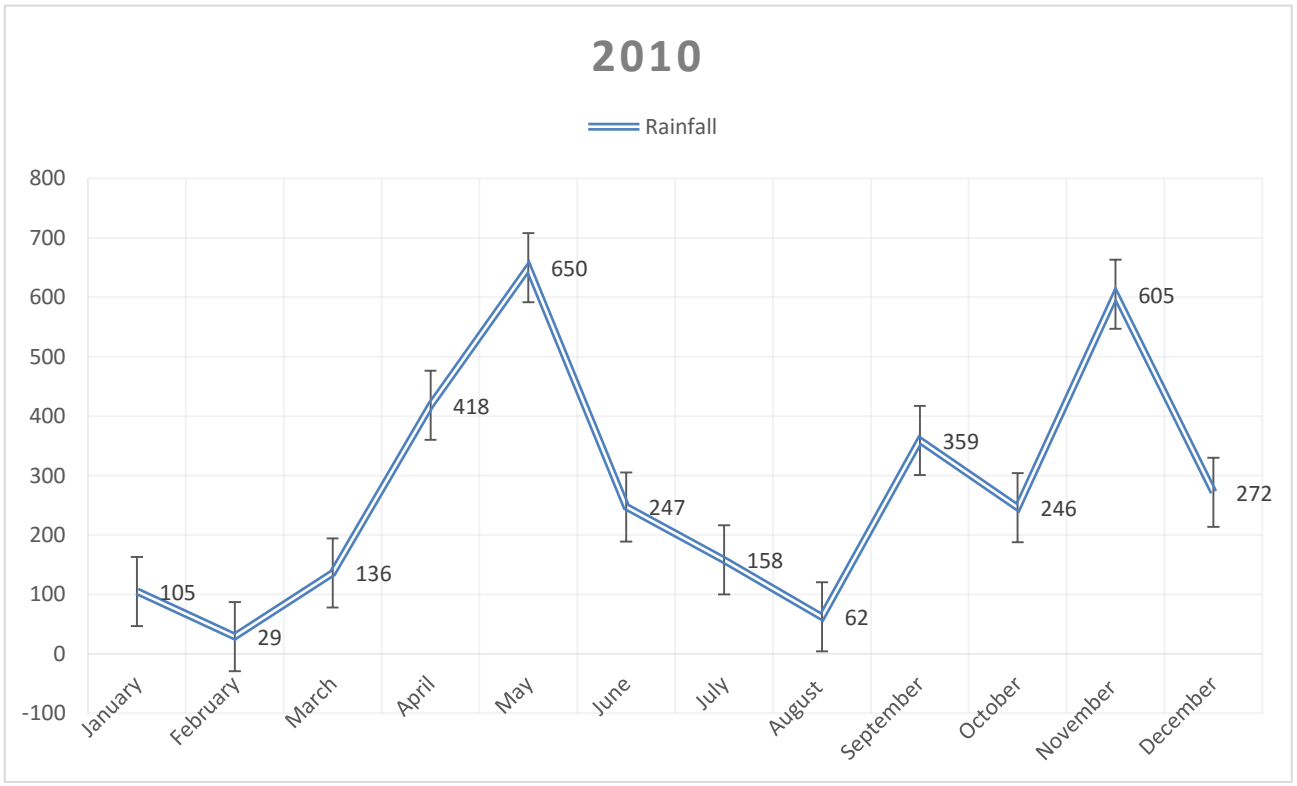


Figure 10 – Average rainfall in 2010

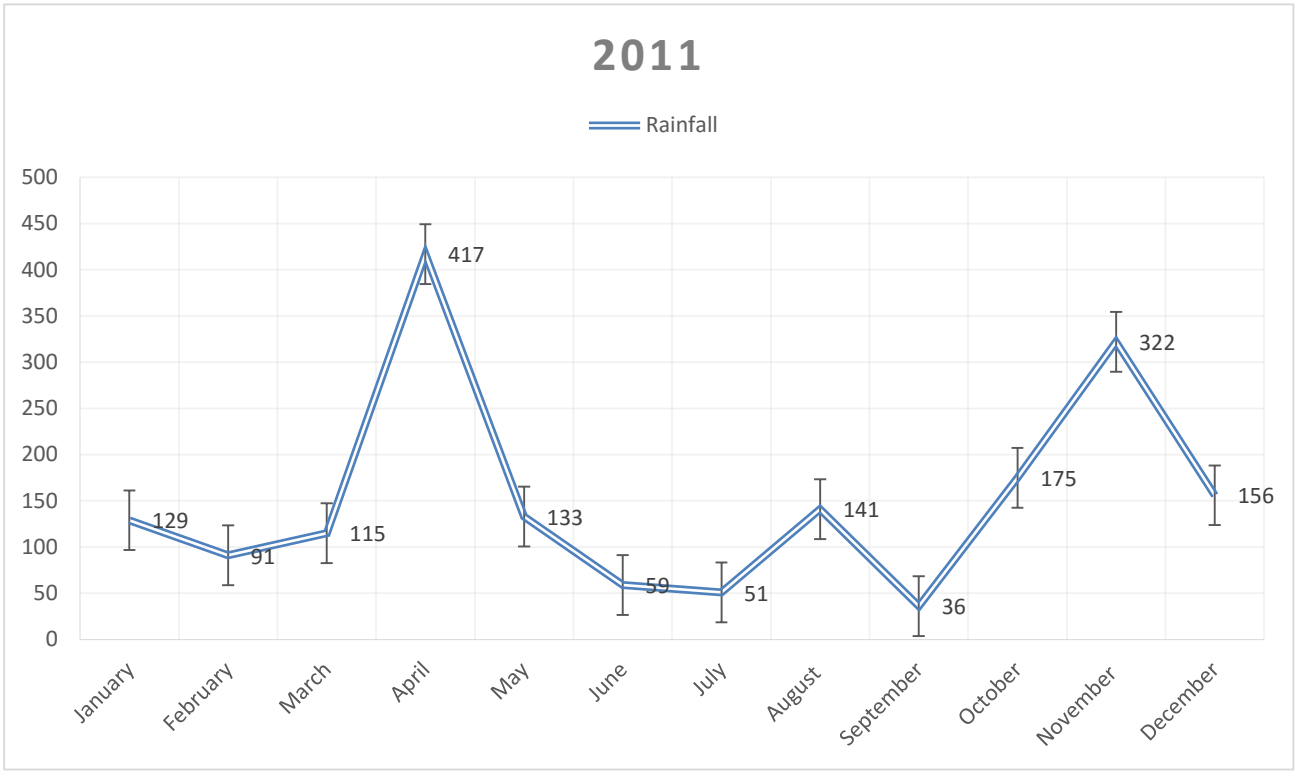


Figure 11 – Average rainfall in 2011

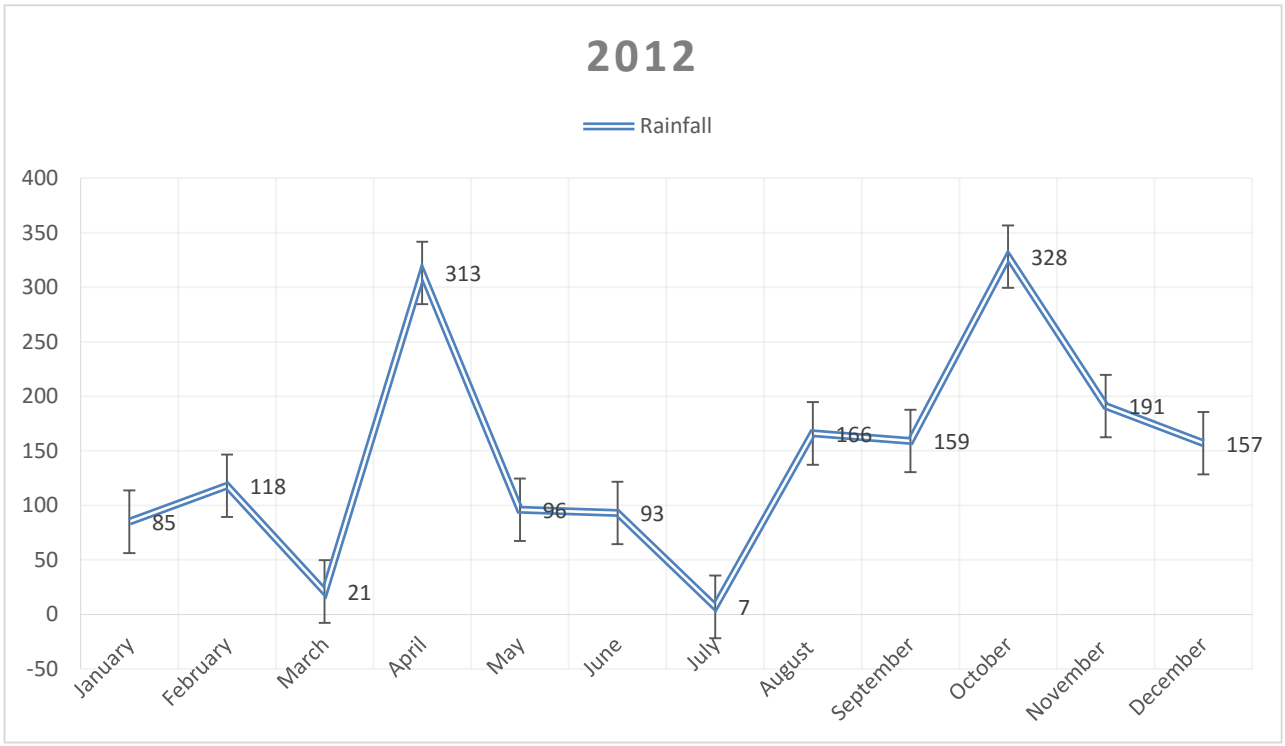


Figure 12 – Average rainfall in 2012

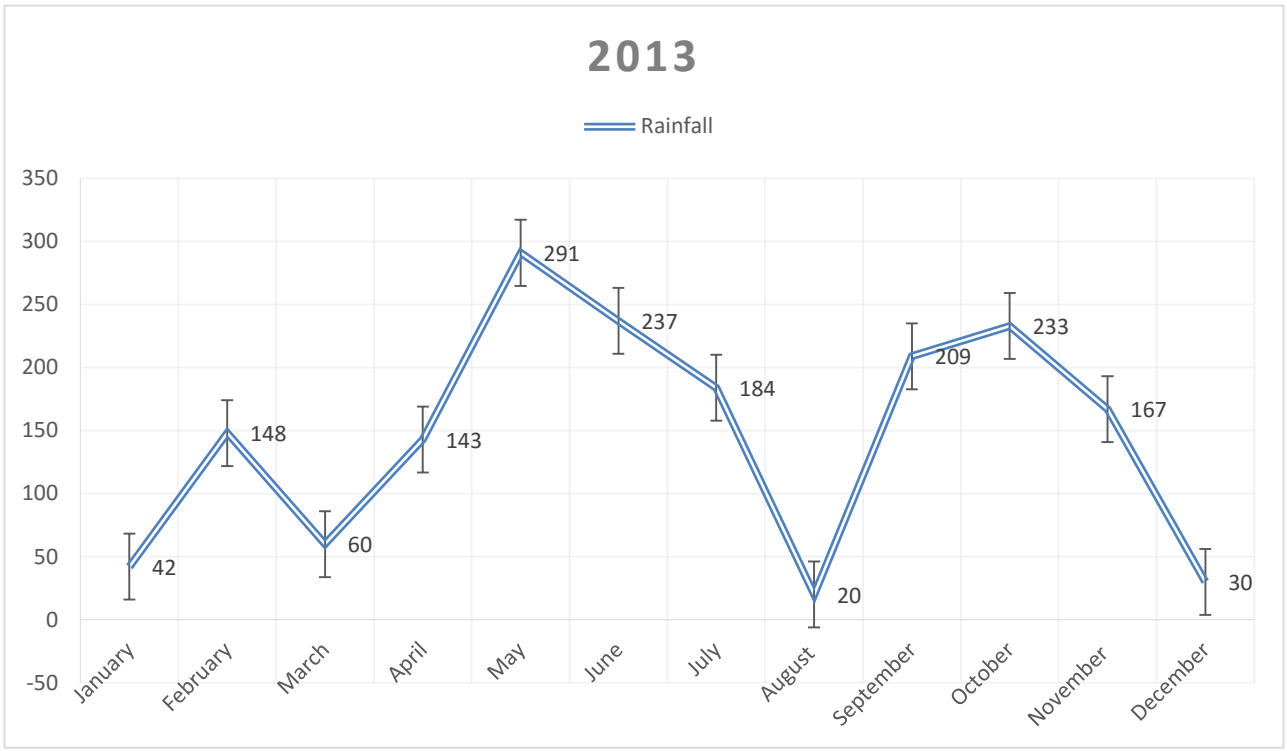


Figure 13 – Average rainfall in 2013

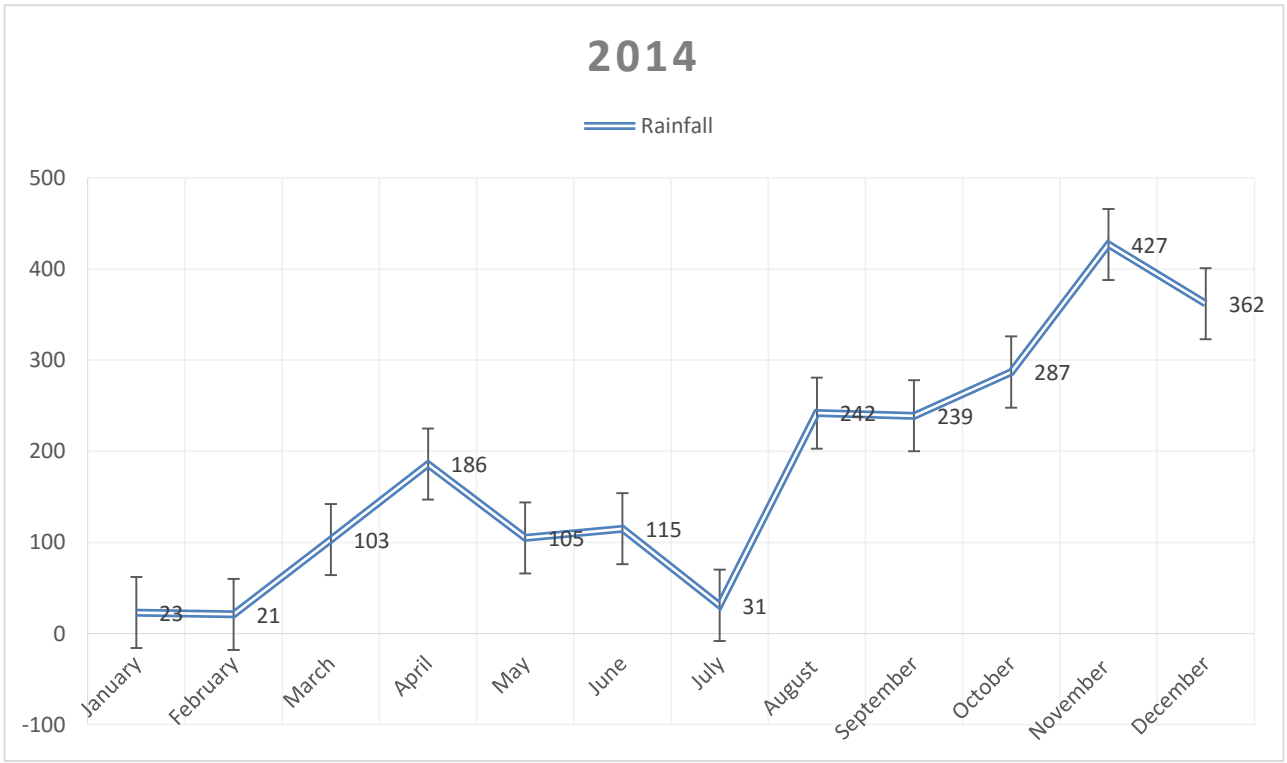


Figure 14 – Average rainfall in 2014

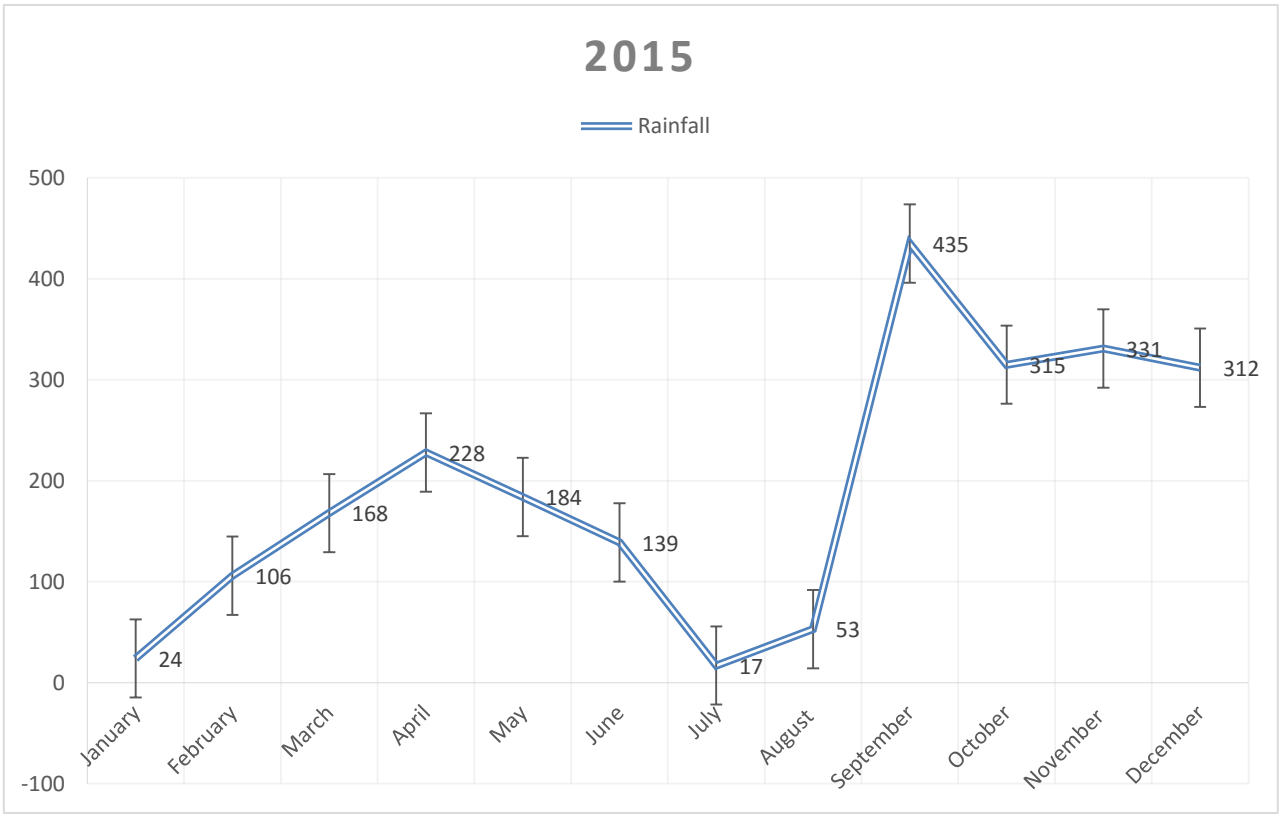


Figure 15 – Average rainfall in 2015

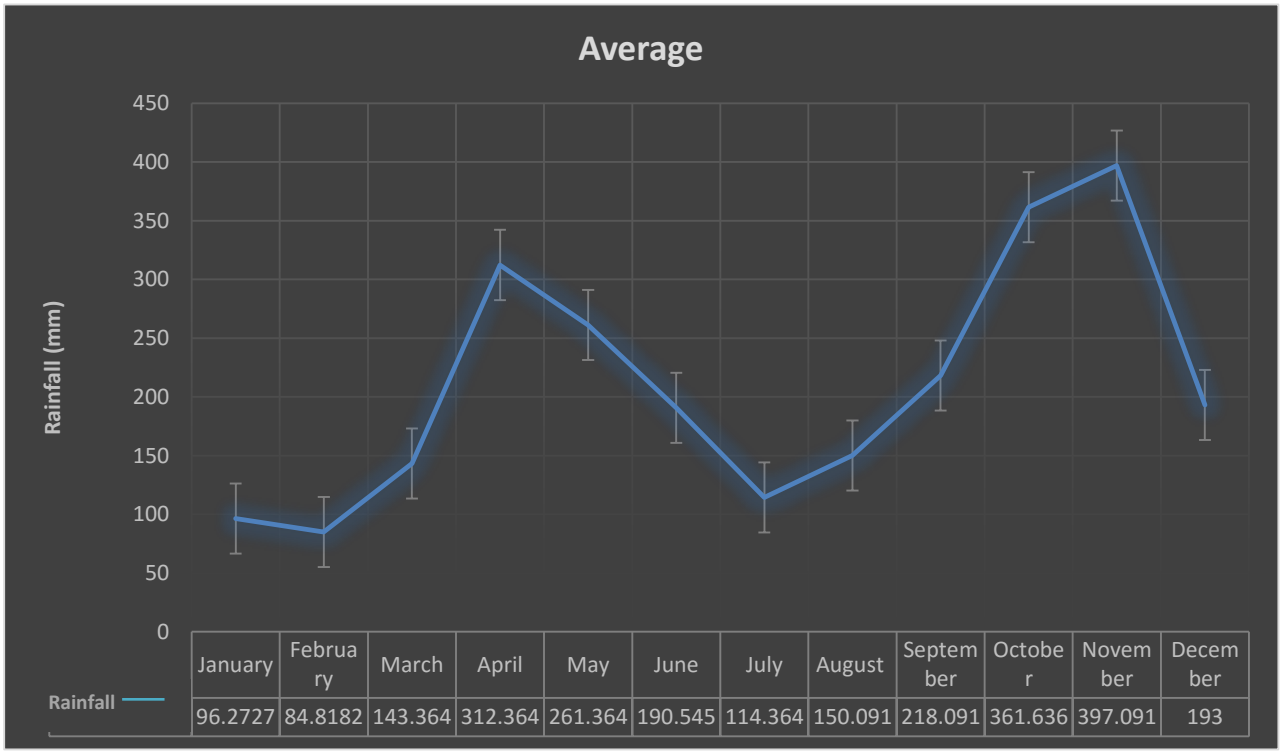


Figure 16 – Average rainfall pattern obtained through the study

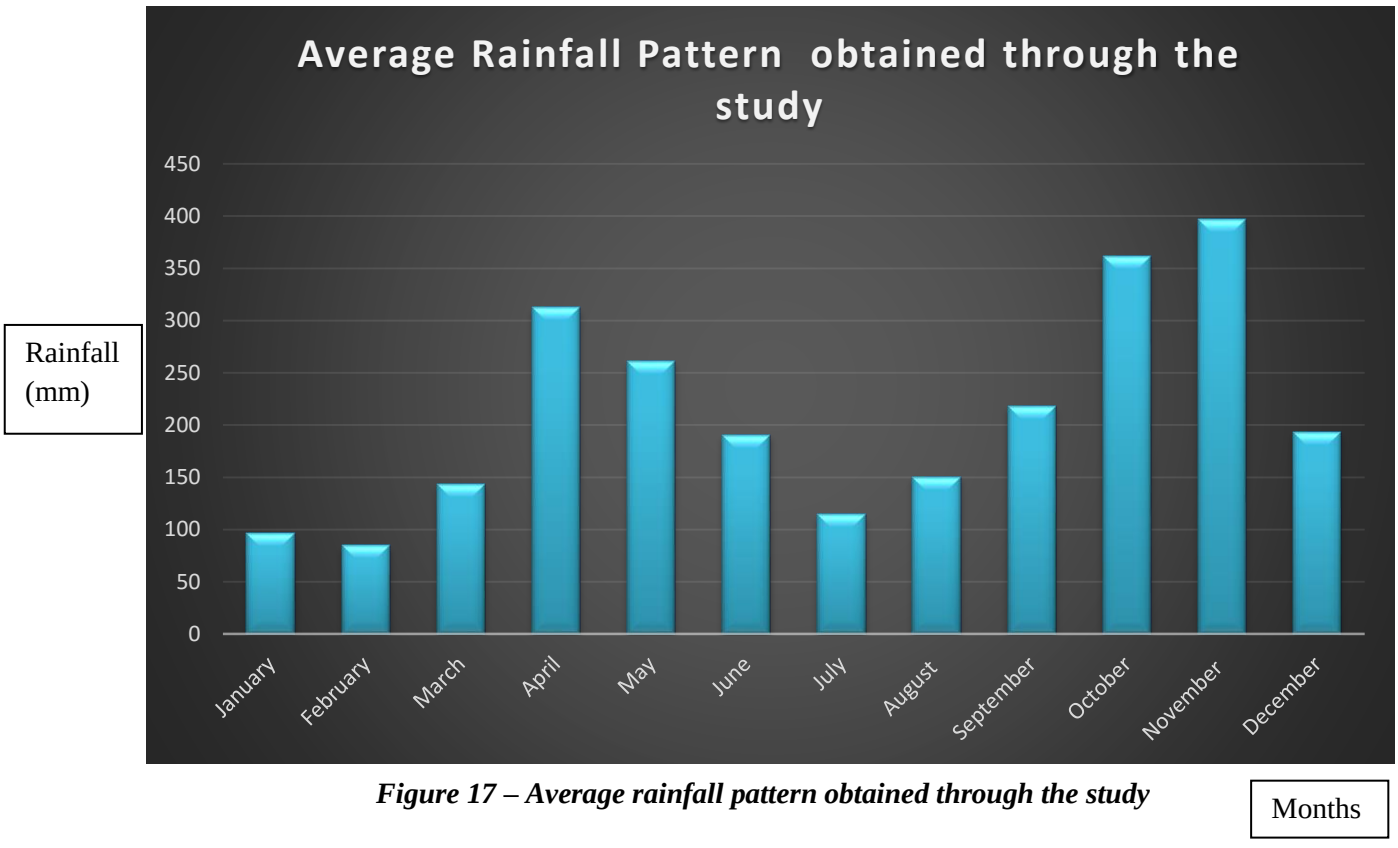


Figure 17 – Average rainfall pattern obtained through the study

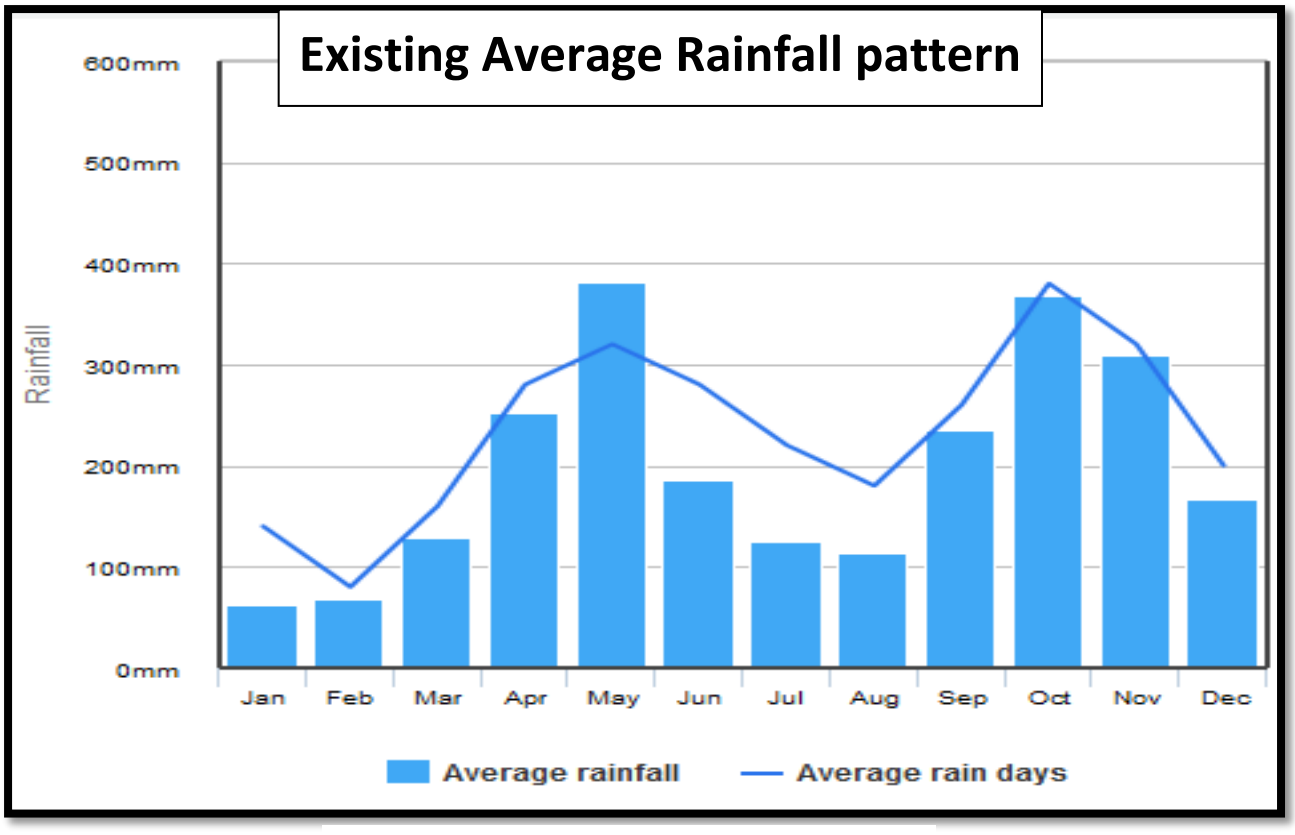


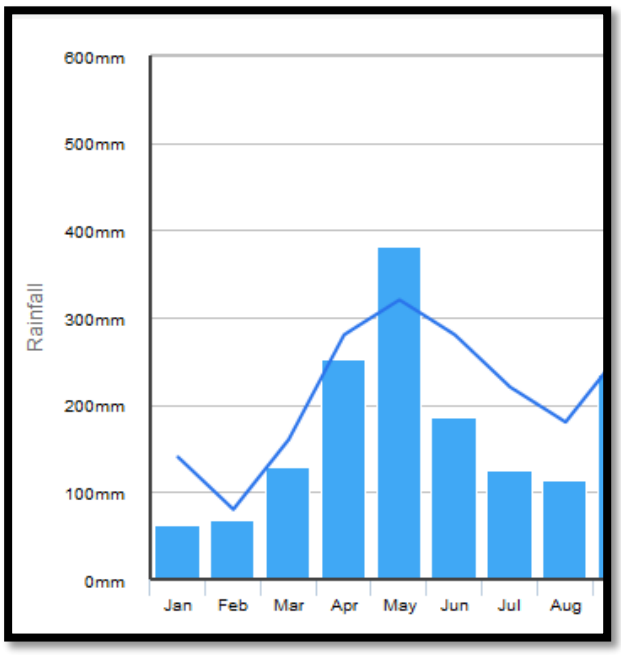
Figure 18 – Existing average rainfall pattern

8.0 DISCUSSION

As agriculture based country most of the Sri Lankan farmers depend on rainfall for their cultivation purposes. Our country's main cultivation crop is paddy. Paddy cultivation is highly susceptible to variations in temperature, rainfall, soil moisture, and increases in the intensity and frequency of extreme events. The main environmental character that set paddy apart from other crops is its high water requirements. The island's rainfall trend basically controls the paddy cultivation. The cultivation of Sri Lanka is carried out in two main cultivations 'Yala' and 'Maha'.

'Yala' season begins in mid march and it extends up to August *(figure 19).* This cultivation season is fed by 'first inter-monsoon' and 'south west monsoon' with plenty of rainfall for Colombo district which belongs to wet zone. Here the highest expected rainfall was to fall within the months May and June. Yet our studies precisely indicate that the highest rainfall in the 'Yala' season is received in the month April which is an unexpected deviation which might cause farmers to face difficulties. Therefore with the newly developed rainfall pattern with the help of the rainfall data collected for the past decade farmers can alter the cultivation schedule in order to adopt the new way of nature.

'Maha' season is the time period between October and February *(figure 20)* of the next year.



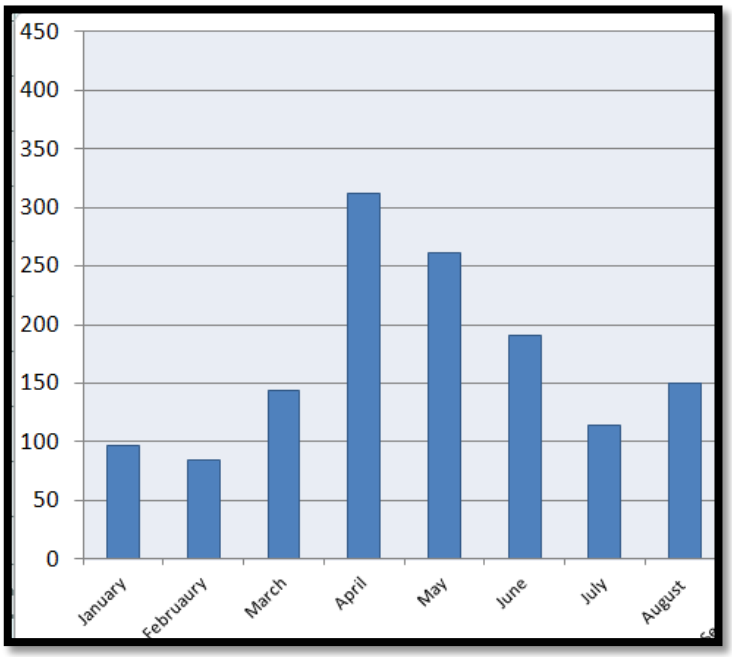
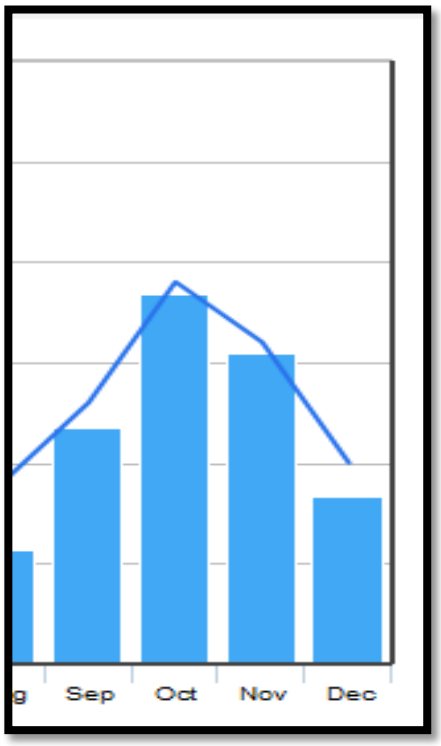


Figure 19 - The existing rainfall pattern in Colombo District ***The pattern we obtained through our results***

This cultivation season is provided with water by 'second inter-monsoon' and 'north east monsoon'.

According to the existing pattern it states that the highest rainfall will be received during the month October but even this pattern has changed over time and our study concludes that the highest rainfall month has now deviated from October to November *(figure 20)*. Although the existing rainfall patterns states that 'Yala' season gets more rainfall than 'Maha' season in the wet zone from our studies we can conclude that 'Maha' season receives a higher rainfall than 'Yala' season. Most of the rains in this time period occur due to depressions in the lower atmosphere and with the newly developed rainfall patterns farmers can now deviate from the conventional method and save most of their crops from harm's way.



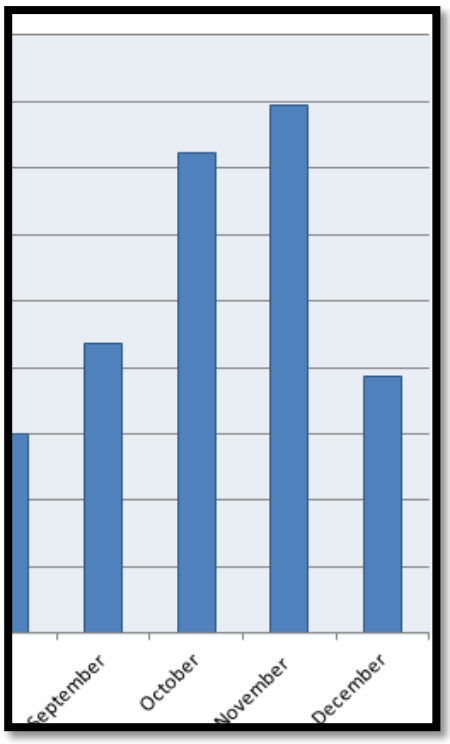


Figure 20 - The existing rainfall pattern in Colombo District ***The pattern we obtained through our***

During the past few decades, paddy production has been destroyed either by severe rain or lack of timely rain, and variable rainfalls over the past two decades according to the studies carried out, have pushed farmers to hold back paddy cultivation until the rain arrive. According to the results obtained through our study we can predict the rainfall in the modern days. With the studies conducted we found that the 'Maha' crop is generally harvested in February, which is traditionally a dry month, but it is now harvested in mid March. But through our research we can clearly come to the conclusion that March is having heavier rainfall than February.

Therefore farmers might have to change their schedules accordingly. This will have a great impact on saving the harvest and go for convenient post harvest methods and increase their income as well. As per the obtained results not only paddy but other cultivations done in Colombo district might have to deviate from their usual cultivating pattern in order to gain better harvest of good quality. This will also help the farmers of all kinds to carry out their cultivations more conveniently.

As the rainfall patterns have deviated over time the farmers who cultivate in the 'Yala' season will have a better chance of having more harvest by starting to cultivate in the 'beginning of March' rather waiting for 'mid March' as highest rainfall is now received in April which was previously May.

In 'Maha' season the cultivators will have to begin their crop cultivation close to November as the highest rainfall is now shifted from the month October to November with the climatic changes taking place in the world. With these deviations made farmers will have a better hope for their cultivations.

Not only the farmers but also the general public will be affected by this change in climate. They can plan and organize their daily routines and year plans according to this new annual rainfall trend we observed through the study. Especially their holiday plans will be affected by this.

And seasonal flight plans will also be slightly affected by this variation in rainfall trend.

Focusing on fishermen they will also have to change plans according to this as their safety will be highly affected by this new rainfall trend as the pattern of wind has also changed accordingly.

9.0 CONCLUSION

According to the results obtained by this study we can arrive at the conclusion that the climate change has affected our country and thereby has changed the annual rainfall pattern in Colombo district. The highest expected rainfall which was obtained during the months 'May and October' now has shifted to 'April and November' which is a significant change in the climate in Colombo.

Through this research we also learned that annual rainfall pattern doesn't stay constant but tends to deviate from its usual pattern with the change in global climate. Therefore it seems that annual rainfall must be calculated and analyzed often to see the deviations and develop pattern accordingly to distant ourselves from harm's way and also to obtain a better harvest for the country and adapt our life styles to live more conveniently.

10.0 REFERENCES

URL

http://www.holiday-weather.com/colombo/averages/
http://www.accuweather.com/en/lk/colombo/311399/weather-forecast/311399
http://www.sereneonline.com/About%20Sri%20Lanka.html
http://onlinelibrary.wiley.com/doi/10.1002/joc.1977/pdf
http://www.pmfias.com/precipitation-types-rainfall-conventional-rainfall-orographic-rainfall-frontal-rainfall-cyclonic-rainfall-monsoonal-rainfall/world-distribution-of-rainfall-precipitation/
http://www.navagoviya.org/index.php?option=com_content&view=article&id=7&lang=en
http://www.ethaksalawa.moe.gov.lk/moodle/pluginfile.php/22789/mod_resource/content/1/Chap%202.pdf
http://www.environmentmin.gov.lk/web/pdf/annual_reports/Book-3-Part-1.pdf

Books

Sri Lanka Rainfall and Agro-Environmental Areas – By Dr. BVR Punyawardana
Britannica Encyclopedia
World Of Facts – By Russell Ash
Rainfall patterns in Sri Lanka
Introduction to statistics and data analysis – By Roxy Peck and Chris Olsen