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ASCERTAINING CORRELATION BETWEEN RAINFALL AND RICE YIELD: CASE STUDY ON THANJAVUR DISTRICT

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ABSTRACT
Thanjavur District, Tamilnadu is the granary of south India, also a fertile region on the banks of river Cauvery. Various rice varieties are cultivated during Kuruvai, Samba and Thaladi season in this region. Paddy is cultivated extensively during Samba season (Jul – Jan) that depends on north east monsoon. Rice requires enormous water for a good yield. The present work identifies the correlation between rainfalls of the region with the crop yield during samba season. All rice varieties along with 5 year [2010-2014] rainfall data for the region are considered for correlation identification.
Keywords: Rainfall, Rice, Crop Yield, Samba season, Correlation

INTRODUCTION

Chozanadu sor udaithu is a famous Tamil saying means Thanjavur region is the rice bowl of Tamilnadu. Tamilnadu Rice Research Institute (TRRI), Aduthurai of the region develops various varieties of different crops that are drought resistant, pest resistant varieties, improved yield varieties etc., ADT 42, ADT (R) 44, ADT (R) 46 are a few popular rice varieties developed by the Institute.

Data mining techniques such as clustering and regression can be employed for prediction of crop yield using rainfall, soil fertility, sun shine etc., Predicting the yield of crops is a classical problem that can be solved using various data mining techniques[1-2]. K means clustering and Multple linear regression with rainfall, area of sowing, year and production is employed to estimate the crop yield[3]. Rainfall and temperature are used to compare between predicted and actual yields[4]. Similar work to estimate crop yield and rainfall using MLR, M5 Rules help in prediction[5-7].

Principal component analysis can be employed for identifying the major components in multivariate environment[8-11].Correlation identification is required to understand the relationships between a dependent and independent variables. This work identifies the correlation between rainfall and crop yield.

EXPERIMENTAL

Thanjavur District lies in 10.8°N 79.15°E, with average temperature between 27 to 40 °C and rainfall 940 mm. The samba season is a favorable season for farmers in the region for rice cultivation. The season is from July and the crops are ready for harvest during January. The rainfall during the samba is north east monsoon winds that usually increase the productivity of the rice. The rainfall data from 2010 to 2015 is obtained from TRRI, Aduthurai, Tamilnadu is given in Table-1 and chart in Figure- 1.

The popular rice varieties grown in the region are CR 1009, ADT 46, ADT 38 and BPT 5204 in an area of 192030 hectares. The yield for the above varieties is given below in Table-2.

Correlation Analysis

Rice requires more water for a better yield, the aim of the work is to ascertain the correlation between rainfall and yield of the region. The results of correlation using Excel Data Analytics is given in Table-3 and the chart is shown in Figure-2.

Table-1: Rainfall in mm during Samba Season for Thanjavur District

Year	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total (mm)
2010	53.2	187.6	88.2	88.4	494	309	1220.4
2011	104.8	156	140.4	215.4	289.8	77.8	984.2
2012	32.2	21.4	124.4	415	87.8	30.4	711.2
2013	21.4	200.2	209	95	269.4	116	911
2014	65.4	154.4	14	444	193.6	139.2	1010.6

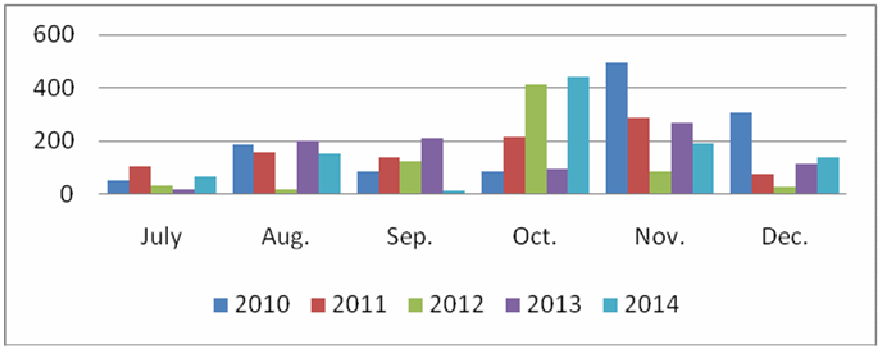

Fig.-1: Chart showing rainfall for Thanjavur district during 2010-2014

Table-2: Popular rice varieties yield for Thanjavur District from 2010 to 2014.

Year	Popular Rice Varieties	Yield tons/hectare
2010	CR 1009, ADT 46, ADT 38 and BPT 5204	5000
2011		5860
2012		5500
2013		4830
2014		5540

Table-3: Correlation between Rainfall and Rice Yield from 2010 to 2014.

Correlation	*Rainfall Total*	*Yield*
Rainfall Total	1	
Yield	-0.25971	1

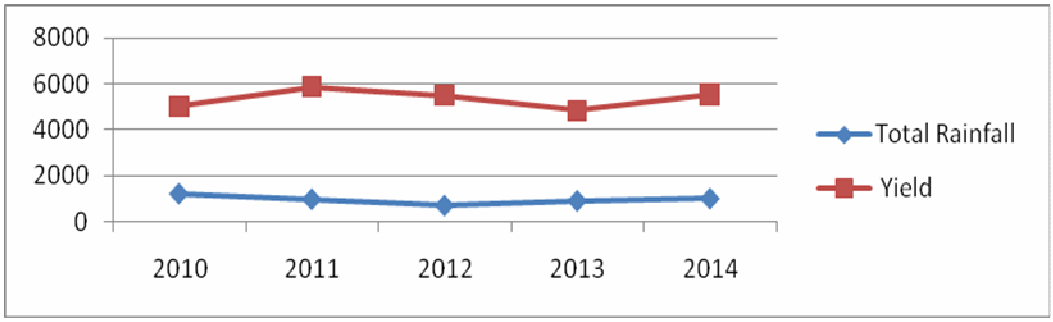

Fig.-2: Chart showing total rainfall and yield for Thanjavur District

The correlation results show that rainfall and yield are negatively correlated. The average rainfall is nearly 950 mm but if the rainfall increased (1220 mm in 2010) the yield was 5000 ton but in 2011 it was (984 mm) and the yield is higher (5860) than the previous year. In the subsequent years from 2012 to 2014 the rainfall, yield are (710, 5500), (910, 4830), (1010, 5540) and there is no correlation existing between rainfall and yield.

RESULTS AND DISCUSSION

The green and blue revolution has brought in various improved technology in agriculture. The farmers use the improved methods and are not dependent on water for irrigation. The other source of irrigation for the region is given in Table-4.

Table-4: Irrigation sources for Thanjavur District.

Irrigation source	
Government Canals	134634
Tanks	498
Tube Wells	26183
Other Wells	4364
River	CAUVERY

It is clearly evident that the yield is not dependent on the rainfall as farmers have other sources like tube wells tanks, canals for irrigation. Conservation of all water sources must be carried out so as to increase the water table that would enable farmers to bring out more yield, hence need not depend on rainfall.

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