



P-ISSN: 2349-8528

E-ISSN: 2321-4902

[www.chemijournal.com](http://www.chemijournal.com)

IJCS 2020; 8(3): 2514-2516

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Received: 19-03-2020

Accepted: 21-04-2020

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## Statistical analysis of food grains production in Madurai district of Tamil Nadu

**K Prabakaran**DOI: <https://doi.org/10.22271/chemi.2020.v8.i3aj.9591>**Abstract**

The Present study was conducted to assess the status of foodgrains production in Madurai district. This study secondary data for the period 1997-98 to 2014-15 selected foodgrains area, production and yield were used. The results of growth rate indicate that rice crop and total cereals area and production showed negative growth during the study periods and yield shows positive growth rate. The similar trend occurs in the overall food grains area and production growth rate also negative and yield shows positive growth rate. Based on Instability analysis, selected cereals and overall foodgrains area, production and yield shows moderate and high instability.

**Keywords:** Growth rate, instability, foodgrains**Introduction**

Agricultural plays an important role in Indian economy. It is the backbone of our country. Tamil Nadu has historically been an agricultural state and is the major producer of agricultural products in India. Tamil Nadu is India's eleventh biggest and seventh most populous country (6 per cent). Madurai is the second most important district in the state of Tamil Nadu, where significant progress has been made in the development of agriculture. Madurai district is basically agrarian and agriculture is the main occupation. Paddy, Millet, Pulses, Cotton are the major crops cultivated in Madurai District. In 2011, Madurai had population of 30, 38,252 of which male and female were 15, 26, 475 and 15, 11, 777 respectively. In 2001 census, Madurai had a population of 25, 78, 201 of which males were 13, 03,363 and remaining 12, 74,838 were females Population of Madurai district steadily increases over the past decade. To meet over food requirement of the population, assessment of food-grains production status is very much essential. In view of above, the study carried out with the following objectives.

- To assess the growth of food grains area, production and productivity in Madurai district.
- To measure the variation in food grains area, production and productivity in Madurai district.

**Methodology**

The present study was purposively conducted in Madurai District of Tamil Nadu. In Food grains, major cereals such as rice, maize, sorghum and cumbu and major pulses such as black gram, green-gram and red-gram were selected to assess the status of food-grains production in Madurai district. Secondary data collected for the period 1997-98 to 2014-15 for selected food grain crops area, production and yield were used. To assess the growth rate and stability of food-grains following methodology adopted in this study.

**Estimation of Growth Rate**

An exponential function of the form

$$Y = A B^t$$

$$\text{Log } Y = \text{log } A + t \text{ log } B$$

Where,

Y = Area / Production / Productivity

A = Constant

B = Regression Coefficient, and

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t = Time (in years)

Compound growth rate (CGR) = (Antilog of B - 1) x 100 used to calculate the compound growth rates in area, production and productivity of selected food-grains.

The instability analysis was carried out as follows.

### Cuddy-Della Valle index (CDVI)

The variation of food-grains area, production and productivity is estimable form of the equation and categorized as follows:

$$I = CV \cdot \sqrt{(1-R^2)}$$

Where

I is the instability index, CV is the coefficient of variation and R<sup>2</sup> is the coefficient of determination

$$CV = \frac{\sigma}{\mu} * 100$$

Where,

$\sigma$  = Standard deviation and  $\mu$  = Mean

### Categorization of CDVI Value

S.No	CDVI Value	Category
1.	0-15	Low
2.	15-30	Moderate
3.	Above 30	High

### Results

#### Growth rates of area, production and yield of food grains

Growth rates obtained from the exponential function fitted to the area, production and yield of food grains in Madurai district are presented in Table 1.

**Table 1:** Compound growth rates (% per annum) of area, production and yield of Food grains in Madurai District

Crops	Area (ha)	Production (tonnes)	Yield (kg/ha)
Rice	-3.97462 (0.032)	-3.40378 (0.152)	0.594733 (0.470)
Maize	24.94916** (0.0000000008)	32.08495** (0.000000001)	5.712832** (0.0007)
Sorghum	0.112995 (0.899)	3.090252 (0.121)	2.973259 (0.059)
Cumbu	4.789205 (0.068)	8.915277** (0.0008)	3.932608** (0.0001)
Total Cereals	-2.23543 (0.088)	-1.84919 (0.385)	0.395074 (0.704)
Black gram	-2.27983 (0.055)	0.247324 (0.913)	2.570722 (0.252)
Green gram	-6.02187** (0.0000002)	-4.48903 (0.107)	1.636795 (0.552)
Red gram	1.427977 (0.225)	3.930959* (0.029)	2.450261* (0.018)
Total Pulses	-2.56533** (0.0006)	0.048258 (0.976)	2.682401 (0.0815)
Food grains	-2.26569 (0.055)	-1.81511 (0.387)	0.461016(0.682)

**Note:** figures in parenthesis indicate probability values.

\* and \*\* indicate significant at 1% and 5% respectively.

It could be observed from Table 1 that the compound growth rates in respect of rice crop and total cereal area, production showed negative growth rate. However the yield growth rates of rice crop and total cereals showed positive growth rate. The other selected cereal crop and such as maize, sorghum and cumbu showed positive growth rate in respect of area, production and yield.

The growth in area under black-gram, green gram and total pulses showed negative growth rate except red-gram showed positive growth rate. All the selected pulse crop and total pulse production and yield showed positive growth rate except green gram, it showed negative growth rate.

The overall food grains area and production growth rate showed negative and yield showed positive growth rate. From this, we conclude the overall food grain trend was similar to that of rice crop and total cereals area, production and yield. The positive growth rate of overall food grain yield indicate that even though food grains area and production showed negative growth rate, production level of decline was less as compare to food grain area.

#### Instability of area, production and yield of food grains

To assess the instability of food grains area, production and yield Cuddy Della Valle Index were computed and the results presented in Table 2.

The results revealed that all the selected cereals and total cereals production showed high instability. Rice crop and total cereals, area and yield showed moderate instability. Maize, cumbu crops area showed high instability and maize, sorghum crops yield showed high instability. In sorghum crop area and cumbu crop yield showed moderate instability. Total pulses area showed low instability, total pulses production showed high instability and total pulse yield showed moderate instability. This may be due to major pulses like green-gram, red-gram showed low instability and black-gram area showed moderate instability.

The overall food grains area, yield showed moderate instability and food grains production showed high instability. From this we conclude, instability of food grains area, production and yield mainly depends on the total cereals area, production and yield instability.

**Table 2:** Instability index of area, production and yield of Food grains in Madurai District

Crops	Area (ha)	Production (tonnes)	Yield (kg/ha)
Rice	26.32775 (Moderate)	35.46024 (High)	15.86319 (Moderate)
Maize	33.25463 (High)	71.15124 (High)	30.6631 (High)
Sorghum	18.46004 (Moderate)	51.00022 (High)	30.98858 (High)
Cumbu	46.08688 (High)	42.87237 (High)	18.0821 (Moderate)
Total Cereals	20.99478 (Moderate)	33.31 (High)	19.91577 (Moderate)
Black gram	24.27631 (Moderate)	51.18269 (High)	41.49719 (High)
Green gram	12.95705 (Low)	47.72737 (High)	47.29427 (High)
Red gram	25.25689 (Low)	36.30775 (Low)	19.50563 (Moderate)
Total Pulses	12.93373 (Low)	34.91352 (High)	29.77973 (Moderate)
Food grains	19.0393 (Moderate)	33.0303731 (High)	21.06325 (Moderate)

## Conclusion

Rice crop area and production showed negative growth during the study periods and yield shows positive growth rate. Maize, Sorghum and Cumbu showed positive growth for area, production and yield. But Total Cereals area and production shows negative growth rate and yield shows positive growth rate. In Pulses Red gram shows positive growth rate in respect of area, production, yield and Black gram production, yield and Green gram yield shows positive growth rate. Black gram area and Green gram area, production shows negative growth rate. Total pulses area shows negative growth rate and production yield shows positive growth rate. The similar trend occurs like total cereals in the overall food grains area and production growth rate also negative and yield shows positive growth rate. Based on Instability analysis, all the cereals area, production and yield shows moderate and high instability. In pulses also shows moderate and high instability in area, production yield except green gram, red gram. Total pulses area shows low instability. The overall food grains area, production and yield also moderate and high instability.

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