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# Studies on the growth and instability of major cropsin selected tahsils of Amravati district

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### Abstract
The present study was based on secondary data collected from various government publications and pertains to a period of 10 year i.e. from 2005-06 to 2014-15. The growth rates of area of major crops were estimated in which growth rate of cotton is found to be increasing during the study period. Coefficient of variation and Coppocks instability index were used to study the instability of major crops in selected tahsils of Amravati district. The instability of mung is found to be highest among other selected crop.

**Keywords:** Growth rate, coefficient of variation, Coppocks instability index

## Introduction
Cropping pattern is defined as a combination of agricultural crops that are grown in a particular geographical area. It can be viewed either in terms of the area allocated for each crop or by the production composition in value terms for any specific area. Therefore, changes in cropping pattern can be seen as the changes in proportion of acreage or the value of production under different crops to total agricultural area or production. The cropping pattern usually changes over time with the development of agriculture, as is evident in the case of agriculture in India (Vyas, 1996).

It is a well noted fact that the growth of agricultural production depends on both acreage and productivity growth. Productivity growth can be further decomposed into two parts. One is the yield growth and other is the cropping pattern change. The former measures the impact of changes in output per unit of area, while, the latter captures the shift of acreage from crops with relatively low values of output per unit of area to higher value crops.

Cropping patterns are the yearly sequence of crops grown and the spatial arrangement of crops. It is formulated within view to obtain maximum crop production under a given situation. Cropping patterns are dynamic and changes occur with changes in factors of production and physiological and social environments. Modifications made in cropping patterns are always to drive the maximum benefit from changed crop growing conditions. Indian agriculture has been diversifying during the last two decades towards High-Value Commodities (HVCs) i.e., Fruits, Vegetables, Milk, Meat, and Fish products.

## Material and Methods
### Analysis of growth and instability of major crops
The growth and instability of crop indicated the performance of crop in study area. It was workout by using following analytical tools.

### a) Exponential model
The growth rates of area of major crops were estimated using exponential model for the period 2005-06 to 2014-15.

$$Y = ab^t$$

Where,
Y = area under selected crops
a & b = parameters to be estimated from exponential model

$$CGR = [Antilog(\log b) - 1] \times 100$$

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**b) Coefficient of variation (C.V)**
Coefficients of variation of area were calculated by using the following formula for the year 2005-06 to 2014-15.

$$C.V. = \frac{S.D.}{Mean} \times 100$$

**c) Coppocks Instability Index (CII)**
To measure the coefficient of instability, Coppocks Instability index was estimated as below

$$m = \frac{\sum [\log(X_{i+1}) - \log(X_i)]}{(N-1)}$$

$$V \text{Log} = \frac{\sum \{[\log(X_{i+1}) - \log(X_i)] - m\}}{(N-1)}$$

$$\text{Coppocks Index} = [\text{Anti} \log(\sqrt{V\text{Log}}) - 1] * 100$$

Where
$X_t$ = area of crop year 't'
N = number of year minus 1
M = The arithmetic mean of the difference between the log of X1 and xt -2 etc.
V log = Log arithmetic variances of the series

## Results and Discussion

**Table 1:** Tahsil wise compound growth rates of area of major crops (in per cent)

| Sr. No. | Crops | Warud | Anjangaon | Achalpur | Dhamagaon Rly. | Chandur Bajar |
|---------|-------|-------|-----------|----------|----------------|---------------|
| 1 | Tur | 2.44** | 2.76** | -5.94* | -1.98*** | 2.49 |
| 2 | Mung | -19.17* | 1.95 | -26.90* | -14.73** | -18.93* |
| 3 | Udid | -6.85* | -17.67** | -12,93* | -8.20* | -17.66* |
| 4 | Cotton | 6.86* | 12.41* | 5.73* | 2.89*** | 1.13* |
| 5 | Soybean | -5.57** | 10.85* | -8.09* | 9.16* | 1.12* |

***, **, * denote statistical significance at 1, 5, 10 per cent level of significance respectively

It is observed from the table 1 that over the period of study in the Warudtahsil the areaunder Tur and Cotton increased significantly by 2.44 per cent and 6.86 per cent respectively, the growth rates of Mung, Udid and Soybean were declined significantly. The area under Mung, Udid and Soybean declined by 19.17 percent, 6.85 per cent and 5.57 per cent respectively.
In the Ajangaontahsil the growth rate of Tur, Cotton and Soybean increased significantly by 2.76 percent, 12.41 per cent and 10.85 per cent respectively and the growth rate of Udid is declined significantly with 17.67 per cent. In case of Mung showed non-significant results.
In Achaplurtahsil the growth rate of area under Cotton increased by 5.73 per cent The growth rate of Tur, Mung, Udid and Soybean declined significantly by 5.94 per cent, 26.90 per cent 12.93 per cent and 8.09 per cent respectively.
In the Dhamangaon Rly. tahsil the compound growth rates of area under Cotton and Soybean increased significantly by

2.89 per cent and 9.16 per cent respectively. The area of Tur, Mung, Udid, declined significantly by 1.98 per cent, 14.73 per cent and 8.20 per cent respectively.
In Chandur Bajar tahsil the growth rates in the area of Cotton and Soybean increased significantly by 1.13 per cent and 1.12 per cent respectively of area under Mung and Udid significantly declined with the 18.93 per cent and 17.66 per cent respectively. The growth rate of Tur showed non-significant result over the study period.

**Coefficient of variation (C.V.) and Coppocks instability index (CII) of area of major crops in selected tahsils of Amravati district**
In order to examine the extent of instability in area of major crops in selected tahsils of Amravati district were workout by using Coefficient of variation and Coppocks instability index and vice-versa. The results were presented in table 2

**Table 2:** Variation in area of different crops in selected tahsils of Amravati district (In per cent)

| Tahsils | Warud | | Anjangaon | | Achalpur | | Dhamangaon Rly. | | ChandurBajar | |
|---------|-------|-----|-----------|-----|----------|-----|-----------------|-----|--------------|-----|
| | CV | CII | CV | CII | CV | CII | CV | CII | CV | CII |
| Tur | 13.56 | 11.77 | 23.96 | 18.25 | 20.32 | 17.86 | 13.91 | 11.25 | 18.30 | 15.94 |
| Mung | 76.92 | 76.64 | 64.49 | 31.80 | 109.63 | 81.23 | 97.85 | 82.30 | 82.46 | 48.47 |
| Udid | 25.95 | 25.57 | 99.46 | 73.39 | 48.71 | 45.20 | 27.74 | 19.75 | 47.55 | 45.14 |
| Cotton | 21.54 | 8.01 | 35.19 | 9.43 | 16.42 | 3.95 | 25.78 | 20.01 | 17.99 | 12.19 |
| Soybean | 24.29 | 22.38 | 34.51 | 30.79 | 34.91 | 33.84 | 30.23 | 30.17 | 6.42 | 4.36 |

Note: Coefficient Of Variation and Coppocks Instability Index of major crops are calculated for the period of 2005-06 to 2014-15

The coefficient of variation measures the absolute variation while coefficient of instability which is also called as instability index, measures the variation around the trend. It could be seen from the table 2
From the table 2 it was observed that in Warud tahsil Mung showed the high coefficient of variation i.e.76.92 per cent whereas Tur showed low coefficient of variation i.e. 13.56 per cent this indicated that Mung crop is more unstable crop of the tahsil. Thecoppocks instability index also indicate the same results i.e.76.64 per cent of variation in Mung whereas 11.77 per cent lowest variation in Tur in the tahsil.

In Anjangaon tahsil Udid and Mung showed the most unstable crop as indicated by 64.49 per cent and 99.46 per cent coefficient of variation respectively. The coppocks instability index for Mung (31.80%), Udid (73.39%) indicated the same result. The coefficient of variation for Tur, Cotton and Soybean is 23.96 per cent, 35.19 per cent and 34.51 per cent whereas coppocks instability index for these crops were 18.25 per cent, 9.43 per cent and 30.79 per cent respectively which indicate the consistency in area of these crops.
In Achalpur tahsil Mung is highly unstable crop with 109.63 per cent coefficient of variation and 81.23 per cent coppocks instability index.

In Dhamangaon Rly. and Chandur Bajar tahsils Mung showed the high instability index 82.30 per cent and 48.47 per cent respectively and also high value of coefficient of variation i.e. 97.85 per cent and 82.46 per cent respectively. It indicated that the area under Mung is not consistant. In other words Mung is unstable in Dhamangaon Rly. and Chandur Bajartahsil. However Tur, Cotton and Soybean showed the stable crops of the Dhamangaon Rly. And Chandur Bajartahsil.

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