

# **Instability analysis of Agricultural Productivity: A District Level Assessment in Karnataka State in India**

## **ABSTRACT**

The study has examined productivity instability of major crops for 20 years by considering first period as 1998-99 to 2008-09 and second period as 2009-10 to 2018-19 at the district level in Karnataka state. Instability categories were grouped as low  $< 15$ , medium 15-30, High  $> 30$ . A low value index indicates the high stability in crop productivity. Through Cudde Della Valle index it was observed that, instability has been low and declined over the time in Rice, Maize, Sugarcane while medium instability noticed in Ragi, and cotton. The trend of instability is high in Arhar, Gram, Groundnut and Jowar. Instability in Pulses and oil seeds is high because area under these crops have been shifted towards Rice, maize which are giving high remunerative prices and assured profit.

**Key words:** Instability, Crop Productivity, Cudde Della Valle, District, Karnataka

## **1. INTRODUCTION**

Indian agriculture is known for fluctuations and instability in its performance. The instability in productivity has a cascading effect on the farm economy and has serious implications for food security. The instability may occur due to its topography, rainfall, climate, socio economic parameters of farmers and government policies. Karnataka is a semi arid state which experiences large variation in climate and recorded as second most drought state after Rajasthan. Despite of its climate adversity, it stood fifth in contribution nominal agricultural GDP with ₹16.29 lakh crore in India (MOSPI,2021). The principal crops grown in state are Rice, Ragi, Jowar, maize, Tur, Gram, Groundnut, sunflower, cotton, sugarcane which nearly contributes more than 60 percent in agricultural productivity in State. The state has 10 agro climatic zones with 30 districts in which some districts cultivate more number of crops and other districts have less cultivation despite of its well suited climatic condition.

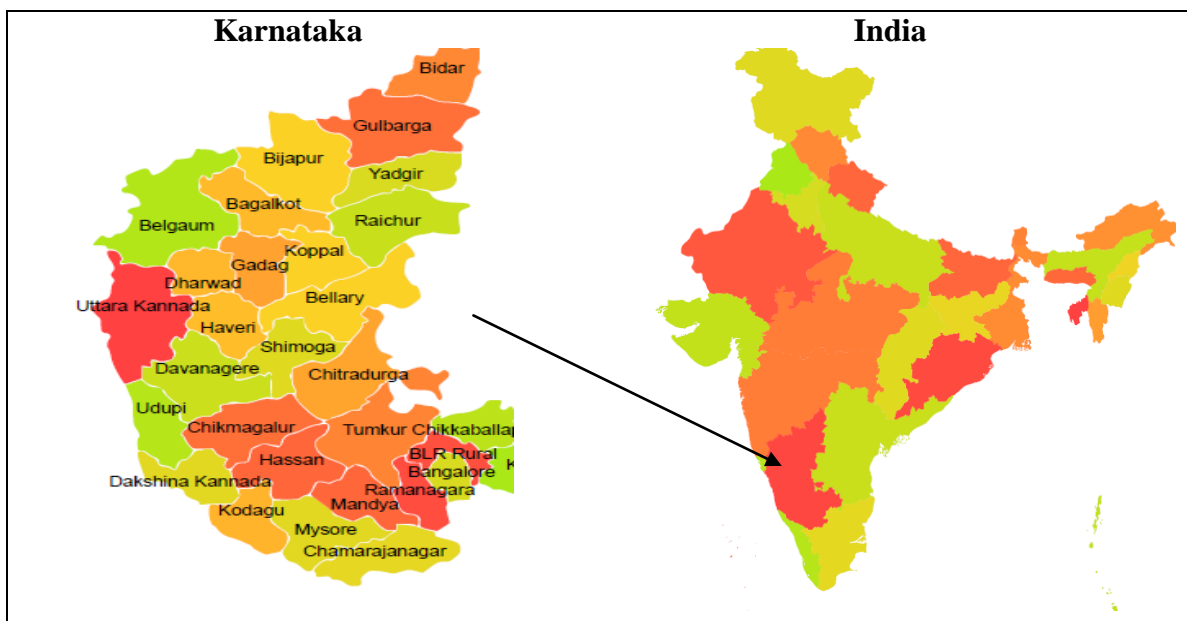
The variation in cultivation leads to fluctuations in productivity across districts which will lead to regional disparities and it also recorded as the majority of districts in Karnataka have very low productivity when compared to Tamil Nadu and Kerala (Ramesh Chand,2011). Instability in agriculture can be shown for area, production or productivity. But this study try to analyse the instability of productivity at district level in Karnataka. Analysing the instability across districts will give reasons and solution for strategies which need to be implement in region level to stabilise and reduce the variations in agricultural Productivity. Increasing, declining and medium trend of instability of crops across the

districts were analysed by comparing the number of districts registering in each category (ve low, medium high ) during first period and shifting of the districts in the second period and finding the possible reasons for crop diversifications.

## 2. MATERIALS AND METHODS

Karnataka is a south semi arid state in India surrounded by Tamil Nadu, Kerala, Andhra Pradesh. It experiences large variation in climate due to its typography and geographical location . It is the only southern state to have land borders with all four southern Indian sister states. The state covers an area of 191,791 sq km in India and It is the sixth largest Indian state by area.

Principal Crops like Rice, Maize, Jowar,Ragi,Redgram,Bengal gram, Sunflower, Groundnut Cotton, Sugarcane were chosen for the study and the necessary secondary data collected for a period of 20 years 1998-99 to 2018-19 .The analysis has compared the situation before and after 2009. The study covers all the thirty districts in state .Information about crop yield was collected from various abstract issues of agriculture crops, Directorate of Economics and statistics, Government of Karnataka.



**Figure 1: Map Showing different districts of Karnataka State in India**

The agricultural instability can be measured by different methods, such as the coefficient of variation (CV), dispersion and Cuddy Della Valle Index (CDI) etc. The present study applies the Cuddy Della Valle Index for measuring the instability. Cuddy Della Valle index first de-trends the given series and gives a clear direction about the instability. The use of coefficient of variation as a measure to show the instability in any time series data has

some limitation. If the time series data exhibit any trend, the variation measured by CV can be over estimated, i.e. the region which has growing productivity are at similar trend rate will score high in instability of productivity if CV is applied for measuring instability. As against that, Cuddy-Della Valle index attempts to de-trend the CV by using coefficient of determination (R<sup>2</sup>). Thus it is a better measure to capture instability in agricultural productivity. A low value of this index indicates the low instability in farm productivity and vice-versa. CDVI was originally developed by Cuddy and Valle (1978) for measuring the instability in time series data that is characterized by trend. The Instability is grouped as follows: Low instability is between 0 to 15, Medium Instability from 15 to 30 and High Instability as above 30

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

$$CV = SD/Mean * 100 \dots \dots (1)$$

Where, CD = Cuddy-Della Valle index (in percent)

CV = Coefficient of variation(in percent)

SD=Standard Deviation

Adjusted R<sup>2</sup>= Coefficient of Determination

### 3. RESULTS AND DISCUSSION

#### 3.1 Productivity Instability of Cereals in Karnataka

As shown in (Table 1 a), Rice is one of the major crop cultivated in Karnataka. It cultivates both in Kharif and Rabi season by providing irrigation. The instability in the productivity of Rice is declining during the second period .Haveri, Belagum and Dharwad showed highest instability during the first period while during second period ,Belagum and Haveri has reported declining trend in instability but Dharwad has showed increasing trend due to its rainfed condition. .Majority of the districts showed declining trend and falls in the category of low and medium instability categories.

Maize was showing decreasing trend in the state during study period (Table 1.b). No districts have recorded high instability categories. All the districts have been registered in low and medium instability categories during both first and second period. The use of high yield varieties , drought resistant are reason for its stable productivity and government assured policy of procurement of produce from maize farmers also encouraged them to increase area under its cultivation by replacing Jowar and Bajra crops.

As shown in (Table 2.a) Ragi has showed medium instability during study period. No district has recorded in the category of high instability. Bengaluru , Shimoga shown declining trend in first period and in the second period, in addition to these districts Mandya,

Uttarkannada, .Haveri showed increased trend in productivity instability. It is also noticed that , the Ragi cultivation has been not noticed in Northern eastern Transition Zone of Karnataka. Ragi shares a large area under cultivation but its productivity instability is very high in majority of districts. There is a need of intervention of improved cultural practices, varietal improvement, irrigation methods to stabilise the crop.

**Table: 1 Productivity Instability of Rice and Maize in Karnataka**

<b>Table 1.a) Rice</b>				<b>Table 1.b) Maize</b>			
<b>1998-99 to 2008-09</b>		<b>2009-10 to 2018-2019</b>		<b>1998-99 to 2008-09</b>		<b>2009-10 to 2018-2019</b>	
<b>Low&lt;15%</b>		<b>Low&lt;15%</b>		<b>Low&lt;15%</b>		<b>Low&lt;15%</b>	
Tumkur	5.87	Bellary	3.90	Udipi	8.03	Bagalkot	11.12
Mysore	6.38	DakshinKannad	4.38	Kodagu	9.04	Chikmagalur	12.41
Davangere	6.97	Udipi	5.00	Bangalore rural	12.93	Udipi	13.80
Mandya	7.46	Mysore	5.68	Bengulur urban	12.94	Dharwad	15.50
Udipi	7.52	Chikmagalur	6.00	Bellary	14.56	<b>Medium 15 to 30%</b>	
Kodagu	8.12	Davangere	6.51	Ramanagar	15.39	Bellary	16.26
Bellary	8.46	Tumkur	6.55	Bagalkot	15.63	Shimoga	17.1
Koppal	9.07	Bijapur	7.31	<b>Medium 15 to 30%</b>		Kolar	19.93
Bagalkot	9.18	Kodagu	7.49	Shimoga	16.62	Belagum	20.32
Raichur	9.21	Bagalkot	7.55	Chamarajanagar	17.18	Tumkur	21.27
Chamarajanagar	9.42	Bangalore	8.04	Bijapur	17.56	Bijapur	22.2
DakshinKannad	9.88	Chitradurga	9.28	Mysore	17.95	Mysore	22.62
Chikmagalur	9.92	Bangalore Rural	9.57	Raichur	19.91	Benguluru	23.03
Bengulur urban	12.87	Shimoga	9.81	Hassan	19.92	UttarKannad	24.03
Shimoga	13.74	Mandya	10.45	Belagum	21.28	Davangere	24.38
Chitradurga	13.97	Uttar Kannada	11.23	Koppal	22.29	Haveri	26.65
Hassan	14.63	Koppal	11.43	Kolar	23.74	Kodagu	27.52
<b>Medium 15 to 30%</b>		Raichur	11.54	Bidar	24.54	Chamarajnar	28.67
Uttar Kannada	17.41	Gadag	12.30	Yadgiri	24.92	<b>High &gt;30%</b>	
Bangalore Rural	21.36	Chikballapur	13.80	Tumkur	26.97	Gadag	30.38
Bijapur	19.77	Ramanagara	14.41	Gulbarga	27.59	Bangalorerural	32.05
Gulbarga	21.06	Chamarajanagar	15.23	Davangere	27.9	Gulbarga	32.13
Kolar	25.56	<b>Medium 15 to 30%</b>		Chikmagalur	27.93	Chikballapur	33.21
Haveri	19.99	Hassan	16.60	<b>High &gt;30%</b>		Chitradurga	35.63
Bidar	26.58	Kolar	22.93	Haveri	35.98	Raichur	35.98
<b>High &gt;30%</b>		Gulbarga	26.25	Chitradurga	33.35	Koppal	36.30
Gadag	32.88	<b>High &gt;30%</b>		Dakshin Kannada	33.65	Hassan	36.97
Haveri	48.98	Belagum	34.28	Mandya	34.96	Mandya	37.63
Belagum	38.22	Bidar	34.78	Dharwad	36.92	Bidar	38.16
Dharwad	60.18	Haveri	35.31	Gadag	37.21		
		Dharwad	41.08				

Source :Authors calculation based on data available from [aps.dac.gov.in](http://aps.dac.gov.in)

Instability in case of Jowar (Table 2. b), majority of districts fall under medium and high instability category Farmers have lost interest in Jowar cultivation and is evidently seen in Gulbarga, Bidar, raichur and other northern transition districts. The area under Jowar is replaced by maize due to its market demand and assured prices.

**Table:2 Productivity Instability of Ragi and Jowar in Karnataka**

<b>Table 2.a) Ragi</b>		<b>Table 2.b) Jowar</b>	
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1998-99 to 2008-09		2009-10 to 2018-2019		1998-99 to 2008-09		2009-10 to 2018-2019	
<b>Low&lt;15%</b>		<b>Low&lt;15%</b>		<b>Low&lt;15%</b>		<b>Low&lt;15%</b>	
Bengaluru Rural	10.27	Mandya	13.95	Gulbarga	11.59	Mandya	9.86
Shimoga	13.91	Shimoga	14.61	<b>Medium 15 to 30%</b>		Davangere	10.31
<b>Medium 15 to 30%</b>		Belagum	15.75	Shimoga	18.73	Bellary	14.05
Kodagu	21.89	<b>Medium 15 to 30%</b>		Bidar	20.53	Shimoga	14.32
Mysore	22.05	Uttar Kannada	17.87	Bellary	20.78	<b>Medium 15 to 30%</b>	
Chamarajanagar	22.6	Bengaluru Rural	19.28	Bijapur	20.91	UttarKannada	16.24
Mandya	23.06	Davangere	21.83	Chitradurga	21.01	Chikmagalur	21.73
Chikmagalur	24.04	Tumkur	22.75	Raichur	21.98	Belagum	22.59
Chitradurga	24.33	Bellary	22.86	Davangere	21.99	Yadgiri	24.19
Kolar	25.59	Mysore	24.92	Belagum	26.48	Raichur	26.07
Hassan	26.01	Ramanagar	26.96	Chamrajanagar	27.12	Bidar	26.18
Chikballapur	27.76	Chikmagalur	26.99	Chikmagalur	28	Gulbarga	26.68
Dharwad	28.58	Chamarajanagar	29.41	<b>High &gt;30%</b>		Bijapur	26.78
Haveri	28.84	BengulurUrban	30.33	Chitradurga	31.01	Haveri	28.86
Tumkur	29.15	<b>High &gt;30%</b>		Uttar Kannada	32.41	<b>High &gt;30%</b>	
Uttar Kannada	29.50	Chitradurga	32.74	Hassan	32.61	Gadag	31.67
Davangere	30.79	Gadag	33.88	Dharwad	36.61	Dharwad	39.06
Bengulur urban	30.97	Hassan	43.36	Haveri	37.8	Tumkur	39.11
<b>High &gt;30%</b>		Kolar	44.18	Tumkur	38.58	Koppal	42.96
Dharwad	31.96			Bagalkot	40.03	Mysore	45.42
Bellary	32.32			Gadag	41.33	Hassan	64.98
Gadag	34.73			Mysore	42.04		
Belagum	42.49			Koppal	47.94		
Haveri	46.06			Chamrajanagar	51.22		
				Mandya	52.94		

Source :Authors calculation based on data available from [aps.dac.gov.in](http://aps.dac.gov.in)

### 3.2 Productivity Instability of Pulses (Arhar & Gram ) in Karnataka

As shown in (Table 3a ) the trends rate of instability in the productivity of Arhar is increasing through out the study period. Bellary,Benguluru,Chitradurga,Chikmaguluru, Haveri, Mandya, Shimoga, Uttar Kannada had low instability during the first period and in the next period except Bellary all other districts had medium instability. Tumkur which has been in medium instability in first period had registered as low instability in second period. Hassan has recorded highest instability during study both first and second period , 20 districts has recorded in low, medium trend of instability and other districts falls in the category of high instability in productivity of Arhar

**Table 3: Productivity Instability of Pulses in Karnataka.**

Table 3.a) Arhar				Table 3.b) Gram			
1998-99 to 2008-09		2009-10 to 2018-2019		1998-99 to 2008-09		2009-10 to 2018-2019	
<b>Medium 15 to 30%</b>		<b>Medium 15 to 30%</b>		<b>Low&lt;15%</b>		<b>Medium 15 to 30%</b>	
Bidar	18.72	Tumkur	20.20	Gulbarga	13.30	Uttar Kannada	17.42
Bellary	19.31	Bellary	24.11	Bidar	15.74	BangulurRural	25.79
Haveri	21.50	Koppal	27.45	<b>Medium 15 to 30%</b>		Belagum	26.48
Uttar Kannada	21.96	Mysore	30.19	Uttar Kannada	18.41	Chiballapur	27.57
Chikmagalur	22.04	<b>High &gt;30%</b>		Raichur	21.14	Gulbarga	26.43

Mandya	22.07	Ramanagar	31.82	Mandya	21.51	Haveri	29.99
Benguluru	22.10	Shimoga	32.14	BangulurRural	23.62	Shimoga	28.40
Shimoga	22.15	Benguluru	32.28	Shimoga	25.03	Bagalkot	27.66
Chitradurga	24.94	Chikmagalur	32.28	Bellary	26.35	<b>High &gt;30%</b>	
Gulbarga	26.94	Chitradurga	32.86	Hassan	26.63	Bellary	33.04
Hassan	27.45	Davangere	33.29	Chitradurga	27.76	Benguluru	36.36
Belagum	29.40	Raichur	34.30	Yadgiri	28.59	Bidar	37.18
BangulurRural	29.41	Kolar	34.50	Belagum	29.57	Bijapur	35.22
Mysore	29.56	UttarKannada	34.61			Chikmaguluru	37.41
Tumkur	30.22	Mandya	35.72	Tumkur	34.75	Koppal	35.25
<b>High &gt;30%</b>		Belagum	36.09	Chikmaguluru	34.82	Mysore	33.68
Bijapur	31.08	Gulbarga	37.54	Haveri	34.96	Raichur	35.49
Kolar	31.61	Bagalkot	39.60	Chmarajanagar	35.61	Tumkur	37.70
Yadgiri	33.90	Gadag	40.73	Bijapur	35.98	Chmarajanagar	46.32
Davangere	34.62	Bijapur	41.44	Bagalkot	36.51	Chitradurga	42.40
Chamarajanagar	35.50	Chikballapur	43.48	Dharwad	42.36	Davangere	46.02
Gadag	37.55	Dharwad	46.26	Benguluru	43.06	Dharwad	48.50
Raichur	42.66	Bangalore	48.83	Mysore	44.88	Gadag	53.52
Haveri	45.03	Bidar	49.07	Gadag	47.54	Hassan	41.96
Koppal	46.73	Hassan	62.85	Davangere	52.95	Mandya	41.89
Dharwad	56.11			Koppal	72.46		
Bagalkot	59.56						

*Source :Authors calculation based on data available from aps.dac.gov.in*

Gram is showing increasing trend in instability during the study period (Table 3.b). During first period Bidar, Gulbarga, Uttar kannada, Mandya, Raichur, Shimoga, Benguluru, has showed declining trend during first period. However, only two districts Uttar Kannada, Bangalore only showed declining trend in second period and all other districts showed increasing trend. Majority of the districts had registered in medium instability category. Koppal has showed highest instability during first period and improved its stability and reported in medium stability category during second period. The instability of gram improved in some district but it was still high in all the districts. The Pulses and oilseeds have registered stable productivity in few districts during second period is due to Technology Mission on Oilseeds and Pulses (TMOP).

### **3.3 Productivity Instability of Oilseeds (Sunflower & Groundnut) in Karnataka**

As shown in (Table 4.a) instability in the productivity of Sunflower is increasing during the study period. During the first period, only three districts showed increasing trend but during second period seven districts showed increasing trend. During first period, Benguluru, Belagum, bellary, Bidar, Chitradurga, Davangere, Gulbarga showed declining trend but during second period except Davangere all other districts showed increasing trend. The area under sunflower is decreasing over the years due to its less remunerative prices, attack of pest and diseases, poor seed quality and less investment of private companies in seed companies.

**Table 4: Productivity Instability of Oilseeds in Karnataka**

Table 4.a) Sunflower				Table 4.b) Groundnut			
1998-99 to 2008-09		2009-10 to 2018-2019		1998-99 to 2008-09		2009-10 to 2018-2019	
Low<15%		Low<15%		Low<15%		Low<15%	
Benguluru	7.81	Tumkur	14.03	Uttar Kannada	7.52	Uttar Kannada	8.85
Bidar	11.55	<b>Medium 15 to 30%</b>		Raichur	8.31	Hassan	12.61
Bellary	11.80	Shimoga	16.07	Bidar	14.89	Udipi	14.05
Benguluru	14.18	Davangere	17.01	Davangere	15.06	<b>Medium 15 to 30%</b>	
Chitradurga	15.55	Raichur	22.00	Gulbarga	15.79	Bagalkot	18.59
<b>Medium 15 to 30%</b>		Haveri	22.01	<b>Medium 15 to 30%</b>		Belagum	18.87
Belagum	16.69	Bengulur rural	26.42	Shimoga	16.75	Davangere	19.89
Gulbarga	18.73	Bellary	28.78	Belagum	16.87	Raichur	21.47
Uttar Kannada	21.09	Bagalkot	29.27	Ramanagara	18.65	Bellary	21.96
Haveri	22.4	Chikballapur	30.42	Bagalkot	19.37	Gadag	22.50
Bagalkot	22.82	<b>High &gt;30%</b>		Mysore	19.85	Bijapur	22.84
Mysore	23.17	Belagum	31.44	Koppal	24.73	Chikmangalur	24.29
Bijapur	23.71	Gadag	32.23	Bangalore	25.00	Kodagu	24.49
Raichur	24.09	Chitradurga	32.24	Bijapur	25.99	Benguluru	24.65
Koppal	26.45	Uttar Kannada	32.41	Hassan	26.89	shimoga	25.89
Mandya	28.88	Mandya	33.28	Yadgiri	27.82	Koppal	26.73
Dharwad	28.96	Chikmagalur	34.02	Chamrajanagar	27.89	Gulbarga	27.40
Shimoga	29.84	Bidar	35.23	Bengulururban	28.38	Haveri	29.39
<b>High &gt;30%</b>		Hassan	35.73	Bellary	28.56	Dharwad	29.83
Ramanagar	31.96	Bengulur urban	37.18	Chikmangalur	28.65	<b>High &gt;30%</b>	
Tumkur	34.04	Koppal	38.15	<b>High &gt;30%</b>		Tumkur	31.97
Gadag	34.41	Bijapur	38.27	Mandya	31.78	Mysore	32.62
Hassan	37.19	Chamarajanagar	40.17	Haveri	32.29	Bidar	36.82
Chamarajanagar	38.53	Gulbarga	42.93	Gadag	32.60	Chamrajanagar	40.39
Chikmagalur	40.69	Yadgiri	46.44	Kodagu	33.83	Chitradurga	40.85
Kolar	51.66	Mysore	47.09	Chitradurga	39.94	Bangalore (R)	40.99
		Dharwad	49.98	Dharwad	46.72	Mandya	41.83
				Kolar	48.22	Chikballapur	46.33
				Tumkur	58.82	Kolar	48.56

Source :Authors calculation based on data available from [aps.dac.gov.in](http://aps.dac.gov.in)

Groundnut is one of the major cash crop grown in Karnataka but biotic, technological .institutional, socio economic constraints inhibit the yield potential in groundnut crop. The rising input prices also showed greater negative impact (Ramesh G.B) on groundnut cultivation. Groundnut registered increasing trend in instability at all Karnataka level during study period. Majority of the districts showed declining trend during first period (Table 4.b) and the same districts showed increasing trend during second period. Bagalkot, ,Bidar,Davangere, Gulbarag,Raichur, Ramanagara,Shimoga,Udipi,Belagum registered as very low instability districts during first period but among these 9 districts only Bagalkot, Udipi, Uttar Kannada,belagum ,Hassan showed declining trend and all other showed increasing trend during second period. Majority of the districts registered in low and medium instability category. Chitradurga,Kolar,Tumkur,Dharwad showed increasing trend and

registered as highest instability districts but additional to these districts Chamaranjanar, Chikballapur, Mandya, Bangalore also registered as highest instability districts

### 3.4 Productivity Instability of Commercial crops (Cotton & Sugarcane) in Karnataka

Cotton registered as medium trend in instability in state during the study period. Bagalkot, Bellary, Bidar, Shimoga were four districts which showed declining trend during first period. Except Bellary, all other 3 districts have showed increasing trend and registered in medium instability category (Table 5.a). During first period Gadag has registered as highest instability district but during second period. Gadag improved while Tumkur which showed lowest instability during first period has registered as highest instability district during second period. Majority of the districts falls in the category of low and medium instability categories.

The trends rate of instability in the productivity of sugarcane is declining during the study period (Table 5.b). It registered low instability in all districts of Karnataka and declining continuously in all times. During first period among 24 sugarcane growing districts, 23 districts showed declined trend which falls in the very low instability category. However, during second period 7 districts has registered in low stability category with slight increasing trend of instability. Haveri has showed increasing trend during first period but slowly it declined in second period while the increasing trend in Gulbarga district was noticed in second period. It was observed that no districts has registered in high instability category. Sugarcane has stable trend in growth of productivity during both periods..

**Table 5 :Productivity Instability of Commercial crops in Karnataka**

Table 5.a) Cotton				Table 5.b) Sugarcane			
1998-99 to 2008-09		2009-10 to 2018-2019		1998-99 to 2008-09		2009-10 to 2018-2019	
<b>Medium 15 to 30%</b>		<b>Low &lt;15%</b>		<b>Low &lt;15%</b>		<b>Low &lt;15%</b>	
Shimoga	16.84	Bellary	14.71	Gadag	8.39	Bangalurrural	8.64
Bellary	17.31	<b>Medium 15 to 30%</b>		Udipi	8.40	Mandya	8.93

Bagalkot	17.75	Bijapur	19.00	Mandya	9.09	Davangere	9.07
Gulbarga	20.89	Dharwad	20.18	Raichur	9.16	Udipi	9.67
Bidar	22.32	Belagum	21.30	Chamarajanagar	9.26	Tumkur	9.99
Raichur	24.60	Chitradurga	21.84	Davangere	9.61	Shimoga	10.12
Tumkur	24.64	Chikballapur	22.45	Koppal	9.70	Mysore	11.72
Bijapur	25.31	Haveri	23.88	Yadgiri	9.76	Chitradurga	12.40
Chikmagalur	25.32	Davangere	26.43	DakshinKannada	9.95	Dharwad	12.59
Chitradurga	25.37	Bidar	29.60	Chitradurga	10.41	Belagum	13.86
Raichur	26.78	Uttar Kannada	30.31	Hassan	10.47	Bagalkot	14.68
Belagum	27.08	Bagalkot	30.78	Bangalore rural	10.81	<b>Medium 15 to 30%</b>	
Mandya	29.95	<b>High &gt;30%</b>		Uttar Kannada	11.56	Gadag	16.00
Haveri	30.31	Koppal	35.26	Bidar	11.63	Ramanagara	16.94
<b>High &gt;30%</b>		Shimoga	35.72	Tumkur	11.87	Koppal	18.11
Davangere	32.25	Gulbarga	36.93	Chikmagalur	12.11	DakshinKannad	18.45
Dharwad	32.37	Hassan	37.73	Bagalkot	12.39	Bellary	18.95
Mysore	36.08	Gadag	38.80	Shimoga	12.41	Chamarajanagar	19.81
Hassan	40.26	Chikmagalur	42.31	Mysore	13.67	Chikmagalur	19.95
Uttar Kannada	40.99	Mysore	43.81	Kolar	13.89	Bidar	20.07
Koppal	45.90	Yadgiri	52.75	Belagum	14.69	Haveri	20.31
Chamarajanagar	49.79	Chamrajanagar	62.35	<b>Medium 15 to 30%</b>		Bijapur	21.37
Gadag	60.31	Tumkur	121.06	Bijapur	17.02	Uttar Kannada	23.70
				Bellary	18.48	Hassan	24.29
				Haveri	29.99	Gulbarga	29.35

*Source :Authors calculation based on data available from aps.dac.gov.in*

## Conclusion

Over the years, the instability and fluctuations in productivity are low in Rice, Maize. The crops like Jowar and Bajra are showing increasing in its instability as area was being diversified towards Maize and Rice. The crop like Ragi and Cotton has showed medium instability which indicates as a profitable crop for farmers with high returns. The Pulses and Oil seeds recorded high instability in major districts of the state. Among the commercial crops, Sugarcane is recorded as well suitable and stable crop in state as it showed low instability in majority of districts. The reasons of stable productivity of rice, maize and sugarcane may be due to market demand, government procurement policies and reasonable market prices respectively. Even though, there is a positive progress in Pulses and Oil seeds production in second period due to TMOP (Technology mission of oilseeds and Pulses) but still targeted results in high productivity yet to be achieved and also there is a need to enhance the productivity of these crops with varietal improvement and cultural practices.

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## Competing interests

Author has declared that no competing interests exists.

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