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Regionwise Trends in Area, Production and Productivity of Gram in Maharashtra

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Abstract: Pulses commonly known as poor man's meat, play a vital role in providing a daily protein dietary requirement of a largest vegetarian population of Indian subcontinent. The pulses occupy a unique position not only in Indian agriculture, but also in Indian diet. The present investigation was aimed to study, "Regionwise Trends in Area, Production and Productivity of Gram in Maharashtra". The data were obtained for the period of 52 years beginning with 1960-61 to 2011-12. The data obtained from secondary sources were analyzed to obtain estimates of annual compound growth rates of area, production and productivity of gram in Maharashtra during different time periods. The area under gram in Maharashtra has increased during the entire period under study. The area, production and productivity of gram increased at the rate of 2.93, 5.4 and 2.4 per cent per annum, respectively during the period from 1960-61 to 2011-12 in Maharashtra. The area under gram in Maharashtra showed 2.93 per cent growth in the study period. Period II was characterized by the increase in area, production and productivity of gram as compared to period I, it might be due to technology mission on pulses with incentive minimum support price. The increase in production was mainly due to the productivity improvement and area expansion of gram. The growth rates in area, production and productivity of gram were positive and significant in Western Maharashtra, Marathwada and Vidarbha regions.

The study suggests that the efforts should be made to improve the productivity of gram in order to increase gram production in Maharashtra.

Keywords: Growth, area, production, productivity and gram

INTRODUCTION

India is the world's largest producer, importer and consumer of pulses accounting about 27 percent of the total production and about 30 percent of the total consumption of the world. The pulses occupies a unique position not only in Indian agriculture, but also in Indian diet. The need of a man on the street also is surely as it Dal-Roti. Pulses are simple food of millions of people as it is the major source of dietary protein. It is due to pulses, the adults among predominantly vegetarian population rarely suffer from protein deficiency. Pulses, a main component of grain legumes, not only play a role of cheap protein supplier in the absence of animal proteins, but also help for fertility maintenance by adding about 30 to 40 kg per hectare nitrogen to the soil through biological fixation in cropping sequence.

Gram is the most dominant pulse having a share of around 40 per cent in the total production followed by Tur/Arhar at 15 to 20 per cent. Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh and Karnataka are the top five pulses producing States. Productivity of pulses is 764 kg/ha. The Recommended Dietary Allowances (RDA) for adult male and female is 60 g and 55 g per day. The per capita availability of pulses is @ 42 g per day. Pulses are chief source of vegetable protein in the human diet (Tiwari, 2016). Since ages, pulses have been well integrated into the farming system of our country as the farmers could produce them by using their own seeds and family labour without depending much on external inputs (NABARD Rural Pulse).

With this view, the present study was undertaken to analyze regionwise changes in area, production and productivity of gram in Maharashtra. The studies undertaken so far had mostly focused on the favorable effects of technological change and reasons of low productivity of gram. The reasons for the rate of

growth behind expectation have been virtually unexamined. Therefore, a study which focuses on both aspects of technical changes i.e. its growth rates in area, production and productivity etc. as well as the reasons for non-technological changes assumes great importance. Considering the above facts it is necessary to analyze the "Regionwise Trends in Area, Production and Productivity of Gram in Maharashtra".

METHODOLOGY

Estimation of growth rates in area, production and productivity of gram

On going through the available literature on growth rates, it was revealed that, the compound growth rates obtained from exponential trend equation give the best fit to the time-series data and have been used widely for estimating growth rates in area, production and productivity of different crops. In order to analyze the growth in area, production and productivity of the crops under study, Compound Growth Rates (CGR) were computed by using the following form of the relationship.

$$Y = ab^t$$

Where,

Y = Area/ Production/ Productivity

a = Constant

B = Regression coefficient

T = Time period in years

$$\text{CGR (\%)} = (\text{Antilog } b-1) \times 100$$

The compound growth rates were estimated for the time periods *i.e.* Period-I (1960-61 to 1980-81, pre pulse mission technology period), Period-II (1981-82 to 2011-12, post pulse mission technology period) and the Overall Period-(1960-61 to 2011-12). The significance of the estimated compound growth rates were tested with the help of student's t-test.

RESULTS AND DISCUSSION

I. Changes in area, production and productivity of gram in Maharashtra

The decadewise data on area, production and productivity of gram in Maharashtra for the period of last 52 years i.e. from 1960-61 to 2011-12 have been analyzed and changes in area, production and productivity of gram in Maharashtra for the period of 52 years have been worked out (Table 1). Since, the main objective of the present study was to estimate growth rates of area, production and productivity of gram in Maharashtra in general, and those in different divisions in particular, it was necessary to examine whether changes had occurred in gram acreage in absolute terms during the different time periods selected for the study in various regions and for the entire state.

The major pulse crop of Maharashtra was gram. The gram production is determined by agro-climatic factors such as soil type, temperature and rainfall pattern, expansion of irrigation facilities, provision of technological inputs and institutional facility, etc. It was observed that, in general there was increase in all the concerned aspects influencing the acreages and production of gram in different regions of Maharashtra. It is therefore expected that, there should have been corresponding changes in area, production and productivity of gram under consideration, unless certain environmental factors had caused the distortion in these parameters.

II. Districtwise and periodwise annual compound growth rates in area, production and productivity of gram in Western Maharashtra

It was revealed from the Table 2, the area, production and productivity of gram showed highest growth at 4.39, 6.63 and 2.08 per cent per annum, respectively in Jalgaon district. At overall level, in period-I, area and production significantly increased at 2.68 and

3.71 per cent per annum, respectively. While, productivity becomes positive but not significant.

During period-II, highest increase in area (5.28 %) of gram was observed in Ahmednagar district, highest production noted in Jalgaon district (7.79 %) and productivity rise observed in Sangli district. At overall level, during period-II area, production and productivity significantly increased at 2.93, 5.4 and 2.4 per cent per annum, respectively.

The significant increase in production in all selected districts of Western Maharashtra region could be mainly attributed to increase in productivity and partly due to area expansion. It concluded that, the production growth pattern in Western Maharashtra region as a whole had been dominated by productivity improvement and area expansion. At overall level in Western Maharashtra, Jalgaon district showed highest growth in area (6.78%), production (9.27%) and productivity (2.31%) per annum, respectively among all the district in the region. At regional in Western Maharashtra significant and positive growth observed in area, production and productivity at 4.45, 6.62 and 2.02 per cent per annum, respectively. It might be due to sufficient irrigation facilities in the region.

III. Districtwise and periodwise annual compound growth rates in area, production and productivity of gram in Marathwada

The districtwise growth rates of area, production and productivity of gram in Marathwada region from the Table 3 revealed that, during period-I the area increased significantly at 1.13 per cent and highest growth in production at 1.94 per cent per annum observed in Aurangabad district. Though area and productivity showed positive trend, production observed to be positive but non-significant and in Nanded district it shows negative growth (2.45 %) during period-I. At overall level in Marathwada region only area increasing significantly, production and productivity though positive but not significant. Area,

production and productivity of gram significantly increased at 7.65, 10.27 and 9.83 per cent per annum, respectively during period-II in Jalna district. As both area and productivity increased significantly, the production increased at higher rate of 10.27 per cent per annum. At overall level in period-II sharp increase observed in area, production and productivity at 3.35, 6.08 and 2.65 per cent per annum, respectively. At overall period in Marathwada area and production showed huge growth in area and production at 34.58 and 32.53 per cent per annum in Latur district, while highest productivity rise recorded in Jalna district (35.98 %). During overall period sharp increase observed in area, production and productivity seen in the region.

IV. Districtwise and periodwise annual compound growth rates in area, production and productivity of gram in Vidarbha

Districtwise annual compound growth rates in area, production and productivity of gram in Vidarbha region are presented in Table 4. It is revealed from the table that, highest growth in area observed in Buldhana district at 3.04 per cent and highest production rise noted in Amravati district at 4.16 per cent per annum. The growth pattern in productivity little bit fluctuating in all districts. Though at overall level in period-I area and production increased by 1.42 per cent and 1.61 per cent but productivity being positive showed non-significant trend. In period-II, highest area and production of gram has significantly increased in Yavatmal district at 8.62 per cent and 12.27 per cent per annum, respectively. Highest productivity rise observed in Amravati district at 3.38 per cent per annum. At the Overall level in period-II area, production and productivity sharply increased at 6.28, 9.4 and 2.94 per cent per annum, respectively. Inter-period comparison revealed that area, production and productivity showed highest growth in period-II. Compare to period-I area, production and productivity of gram significantly increasing at

Table 1
Changes in area, production and productivity of gram in Maharashtra

Area (A) = 00' ha, Production (P) = 00' tones, Productivity (Y) = kg/ha

Period	Western Maharashtra			Marathwada			Vidarbha			Overall		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1960-61	671.00 (100.00)	160.00 (100.00)	238.45 (100.00)	1264.00 (100.00)	150.00 (100.00)	118.67 (100.00)	591.00 (100.00)	157.00 (100.00)	266.00 (100.00)	2526.00 (100.00)	467.00 (100.00)	622.77 (100.00)
1981-82	1572.00 (134.28)	636.00 (297.50)	404.58 (69.67)	1832.00 (44.94)	815.00 (443.33)	444.87 (274.88)	793 (34.18)	266 (69.43)	335 (26.27)	4197.00 (66.15)	1717.00 (267.67)	1184.88 (90.26)
2011-12	2827.00 (321.31)	2005.17 (1153.23)	709.29 (197.46)	3771.00 (198.34)	2790.64 (1760.43)	740.03 (523.60)	3981 (573.60)	3108 (1879.91)	781 (193.93)	10579.00 (318.80)	7904.27 (1592.56)	2230.14 (258.10)

(* , ** and *** indicate significance level at 10, 5 and 1 per cent level, respectively.)

Table 2
Annual compound growth rates in area, production and productivity of gram in Western Maharashtra

Sr. No.	District	Period-I (1960-61 to 1980-81)			Period-II (1981-82 to 2011-12)			Overall (1960-61 to 2011-12)		
		A	P	Y	A	P	Y	A	P	Y
1.	Nasik	0.16	1.47	1.48	1.46**	3.55***	2.06***	2.04***	3.78***	1.68***
2.	Dhule	0.34	1.28	0.05	1.02	3.67***	2.85***	2.38***	4.45***	2.15***
3.	Jalgaon	4.39***	6.63***	2.08*	4.5***	7.79***	3.15***	6.78***	9.27***	2.31***
4.	Ahmednagar	-0.71	0.87	1.08	5.28***	7.2***	1.82***	3.24***	5.12***	1.83***
5.	Pune	0.17	1.32	1.14	2.04***	3.75***	1.68***	2.48***	4.63***	2.04***
6.	Solapur	3.28***	2.28	-0.77	1.46***	4.5***	3***	1.42***	3.27***	1.75***
7.	Satara	-1.44*	-1.27	0.58	3.16***	4.74***	1.53***	1.95***	3.44***	1.47***
8.	Sangli	1.56	0.38	-1.6	2.32***	5.77***	3.37***	2.46***	4.67***	2.1***
9.	Kolhapur	3.83	5.41*	1.33	2.46**	4.23***	1.72***	2.46***	4.67***	2.1***
	Western Maharashtra	2.68***	3.71**	1	2.93***	5.4***	2.4***	4.45***	6.62***	2.02***

(Figures in parentheses indicates the percentage change over the base year 1990-91)

Table 3
Annual compound growth rates in area, production and productivity of gram in Marathwada

Sr. No.	District	Period-I (1960-61 to 1980-81)			Period-II (1981-82 to 2011-12)			Overall (1960-61 to 2011-12)		
		A	P	Y	A	P	Y	A	P	Y
1.	Aurangabad	-0.5	1.42	1.94*	2.09***	6.23***	3.94***	0.51**	2.96***	2.5***
2.	Jalna	0	0	0	7.65**	10.27***	9.83**	30.92***	29.28***	35.98***
3.	Beed	0.72	0.25	-0.23	2.02***	4.24***	2.17***	0.24	1.9***	1.69***
4.	Latur	0	0	0	4.27***	7.18***	2.79***	34.58***	32.53***	35.6***
5.	Osmanabad	1.13***	1.38	0.25	2.78***	5.13***	2.28***	0.19	1.89***	1.69***
6.	Nanded	-1.49**	-2.45*	-1.06	5.76***	9.45***	3.48***	1.74***	3.93***	2.16***
7.	Parbhani	0.88*	0.21	-0.71	1.79***	4.19***	2.35***	1.34***	3.41***	2.04***
	Marathwada	1.02*	2.6	1.56	3.35***	6.08***	2.65***	1.71***	3.92***	2.17***

(*, ** and *** indicate significance level at 10, 5 and 1 per cent level, respectively.)

Table 4
Annual compound growth rates in area, production and productivity of gram in Vidarbha

Sr. No.	District	Period-I (1960-61 to 1980-81)			Period-II (1981-82 to 2011-12)			Overall (1960-61 to 2011-12)		
		A	P	Y	A	P	Y	A	P	Y
1.	Buldhana	3.04*	3.45*	0.2	7.08***	9.97***	2.7***	5.66***	8.47***	2.62***
2.	Akola	0.66	-0.49	-0.69	5.36***	8.42***	2.9***	3.75***	6.21***	2.34***
3.	Amravati	3.02***	4.16***	1.03	6.48***	10.05***	3.38***	5.79***	8.75***	2.76***
4.	Yavatmal	-1.37	-0.71	1.21	8.62***	12.27***	3.32***	3.74***	6.28***	2.55***
5.	Wardha	1.18*	-0.34	-1.63	6.71***	8.97***	2.11***	5.08***	7.29***	2.12***
6.	Nagpur	2.95***	2.23*	-0.61	5.74***	8.37***	2.48***	4.71***	6.58***	1.8***
7.	Bhandara	0.05	-0.75	-0.65	-2.6***	-1.01	1.56***	-1.31***	-0.53	0.81***
8.	Chandrapur	2.19***	1.8***	-0.24	1.32***	2.44***	1.12**	0.33*	0.59**	0.3
9.	Gadchiroli	—	—	—	-1.78***	-0.23	1.52***	17.27***	14.61***	26.64***
	Vidarbha	1.42***	1.61*	0.19	6.28***	9.4***	2.94***	4.19***	6.44***	2.16***

(* , ** and *** indicate significance level at 10, 5 and 1 per cent level, respectively.)

17.27, 14.61 and 26.64 per cent per annum, respectively in Gadchiroli district which is highest among all districts of Vidarbha. At regional level area, production and productivity significantly increased at 4.19, 6.44 and 2.16 per cent per annum, respectively.

V. Districtwise and periodwise annual compound growth rates in area, production and productivity of gram in Maharashtra

It was revealed from Table 5 that, during the overall period area, production and productivity of gram significantly increased at 1.66 and 3.3 and 1.62 per

Table 5
Annual compound growth rates in area, production and productivity of gram in Maharashtra

Sr. No.	Region	CGR (%)								
		Period-I (1960-61 to 1980-81)			Period-II (1981-82 to 2011-12)			Overall (1960-61 to 2011-12)		
		A	P	Y	A	P	Y	A	P	Y
1	Western Maharashtra	2.68***	3.71**	1	2.93***	5.4***	2.4***	4.45***	6.62***	2.02***
2	Marathwada	1.02*	2.6	1.56	3.35***	6.08***	2.65***	1.71***	3.92***	2.17***
3	Vidarbha	1.42***	1.61*	0.19	6.28***	9.4***	2.94***	4.19***	6.44***	2.16***
	Maharashtra	1.66**	3.3**	1.62*	4.01***	6.72***	2.61***	2.93***	5.4***	2.4***

(* , ** and *** indicate significance level at 10, 5 and 1 per cent level, respectively.)

‘#’ – Newly formed district, area so far recorded is under Bhandara district)

cent per annum, respectively in period-I. During period-II area, production and productivity of gram increased significantly at 4.01, 6.72 and 2.61 per cent per annum, respectively. Inter-region comparison reflects that, sharp increase in area, production and productivity observed in period-II compare to period-I. At overall period at state level area, production and productivity of gram increased significantly at 2.93, 5.4 and 2.4 per cent per annum it might be due to technology mission on pulses with incentive minimum support price. The results are corroborated the findings of Gaikwad (2017) and Gajbhiye (2002).

CONCLUSIONS

1. The study has revealed that the production under gram in Maharashtra and especially in all gram growing district and states as a whole has been increased during period-II compared to period-I, this may be due to improvement in productivity of pulses.
2. Inter-region comparison showed the highest growth in period-II compared to period-I. Area, production and productivity of gram at overall period, in Maharashtra increased significantly, introduction of technology mission on pulses with promising minimum support price. The growth in area, production and productivity of

gram for Maharashtra, at overall period, increased significantly, while it might be due to green revolution and introduction of technology mission on pulses.

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