Trends in Biosciences 10(3), Print : ISSN 0974-8431, 1071-1073, 2017

Dynamic of Area Production and Productivity of Gram in Madhya Pradesh

H. K. NIRANJAN* AND J. K. GUPTA

Deptt. of Agricultural Economics, MGCGV, Chitrakoot, Satna, Madhya Pradesh
**email: office.hemant@gmail.com*

ABSTRACT

The present study covered time series data from 1979-80 to 2010-11 of area, production and productivity in gram of Madhya Pradesh. This period of study divided into 3 sub-periods i.e. 1979-80 to 1994-95, 1995-96 2010-11 and 1979-80 to 2010-11 for batter interference of the study. The study revealed that the area, production and productivity of gram found to be increased positive and significant in overall period of study. The area, production and productivity were found to be increased in pre-WTO period as compared to post WTO period. The area, production and productivity shared less fluctuation in post-WTO period as compared to pre-WTO period revealed that productivity of gram in Madhya Pradesh is maintaining its sustainable level over the period of time.

Key words *Growth, Gram, production and sustainability yield index*

Pulses include a number of crops which are mostly leguminous and provide much needed vegetable proteins to a largely vegetarian population of India. They serve as excellent forage and grain concentrates in the feed of cattle. Pulses have the capacity to fix atmospheric nitrogen in the soil and are normally rotated with other crops to maintain or restore soil fertility. Though gram and tur (arhar) are the more important pulses, several other pulses such as urd (black gram), mung (green gram), masur (lentil), kulthi (horse gram), matar (peas), khesri and moth are also grown. Gram is the most important of all the pulses and accounts for 37 per cent of the production and 28.28 per cent of the total area of pulses in India. Although gram is cultivated in several parts of the country; most of the gram comes from Madhya Pradesh, Uttar Pradesh, Rajasthan, Haryana and Maharashtra. These five states produce over 90 per cent gram of India. According to 2002-03 figures, Madhya Pradesh is the largest producer with 16.23 lakh tonnes (39.29%) to its credit. Vidisha, Bhind, Morena, Chhatarpur, Jabalpur, Narsingpur, Dhar, Hoshangabad, Raisen, and Gwalior are significant producers. Next to Madhya Pradesh is Uttar Pradesh producing 7.79 lakh tonnes (18.86% of India) of gram. Sahu and Mishra (2013) studied trend analysis using different parametric model and forecasting the production, import - export (both in quantity and value) and trade balance of total spices in India and China along with world using different parametric trend models using time series data covering the period of 1961-2009. Niranjan *et al.,* (2015) studied the sustainability of yield of major food grains in Madhya Pradesh.

MATERIAL AND METHODS

The data collected from published sources and various issues of agriculture at glances on area, production, yield of Gram in Madhya Pradesh from 1979-80 to 2010-11. However, keeping parity with the objective of the study best possible common period of information are used in this study. To examine the nature of each series these have been subjected to get various statistics. Compound growth rate were estimate with the following exponential model using least square technique and to get an overall movement of the time series data, trend equations are fitted. In this study used linear models for the purpose.

Exponential Model $Y = ab^t$

Where,

Y= Trend value of dependent Variable (Area, Production and Yield)

A= Constant

B= Trend coefficient (slop of line)

T= Time variable (year)

The function takes the form of a linear equation in logarithmic and become log linear as under logy = loga + tlogb

Compound growth rate (CGR) = (Anti logb-1)*100

$$Relative\ Change\ (RC\%)\ \frac{Yn - Yo}{Yo} x100$$

Where,

Yn= Triennium current year i.e. average of first three year

yo= Triennium base year i.e. average of first three year

Sustainability Yield Index

The whole period was divided into two period's viz., period- I from 1979 to 1995 and period- II from 1996 to 2010 to compare in area, production and yield between the two periods.

(1) Singh *et al.,* (1990) has given the following measures of sustainability. Sustainability Yield Index (SYI) = $\frac{\bar{y} - s}{y_{max}}$, where $\bar{y}$ is the average yield of a treatment, s is the standard deviation of yields over the years and y_{max} is the maximum yield of a treatment in any year. Higher the value of the index, higher is the sustainability status.

(2) Sahu *et al.,* (2005) SYI = $\frac{Y_{max} - \bar{Y}}{\bar{Y}}$ a sustainability index value closer to zero is the most desirable value.

(3) Pal and Sahu (2007) SYI = $\frac{s_i}{\bar{y}_i} \cdot \frac{1}{s_{max}}$ lower the value of the Sustainability Yield Index higher is the sustainability.

Table 1. Growth of area, production and productivity of gram in M. P.

Particular	Pre-WTO Period		
	Area (000 ha)	Production (000 ton)	Yield (Kg/ha)
Average	2221.14	1565.05	698.70
Standard deviation	213.07	365.15	108.67
Base year	2003.33	1116.37	561.56
Current year	2476.33	2066.27	830.31
Absolute Change	473.00	949.90	268.75
Relative Change (%)	23.61	85.09	47.86
Coefficient of variance (%)	9.59	23.33	15.55
Simple growth rate (%)	1.28	4.13	2.79
Compound growth rate (%)	1.27**	4.27**	2.96**
	Post-WTO Period		
Average	2627.10	2368.57	897.42
Standard deviation	267.13	433.28	105.05
Base year	2585.10	2242.20	868.98
Current year	3012.70	2925.70	971.69
Absolute Change	427.60	683.50	102.71
Relative Change (%)	16.54	30.48	11.82
Coefficient of variance (%)	10.17	18.29	11.71
Simple growth rate (%)	1.01	1.55	0.48
Compound growth rate (%)	0.98	1.43	0.45
	Overall		
Average	2424.12	1966.81	798.06
Standard deviation	314.68	567.43	145.75
Base year	2003.33	1116.37	561.56
Current year	3012.7	2925.7	971.69
Absolute Change	1009.37	1809.33	410.14
Relative Change (%)	50.38	162.07	73.04
Coefficient of variance (%)	12.98	28.85	18.26
Simple growth rate (%)	1.07	2.56	1.54
Compound growth rate (%)	1.07**	2.72**	1.63**

** Significant at .01 % probability level and * Significant at .05 % probability level

RESULT AND DISCUSSION

Growth rate

The growth of area, production and productivity of gram in Madhya Pradesh has been examined and presented in Table 1. The area of gram has been found increased from 2003.33 thousand hectares (1979-80) to 3012.7 thousand hectares (2010-11) in Madhya Pradesh, showed a relative change of 50.38 per cent with fluctuation of 12.98 per cent during the period under study. Overall simple (1.07%/year) and compound growth rate (1.07%/year) of gram was found to be positive highly significant. The growth of area of gram was found positive highly significant in pre-WTO period (1.28 & 1.27%/year) as compared to post WTO period (1.01 & 0.98%/year), where as it was found positive and non-significant. The fluctuation in area of gram was more in post-WTO period (10.17%) as compared to pre-WTO period (9.59%).

The production of gram has been found to be increased with a relative change of 162.07% from 1116.37 thousand hectares (1979-80) to 2925.7 thousand hectares (2010-11) in Madhya Pradesh, with fluctuation of 28.85 per cent during the period under study. Overall simple (2.56%/year) and compound growth rate (2.72%/year) of gram was found to be positive highly significant. The simple and compound growth of production of gram was found positive highly significant in pre-WTO period (4.13 & 4.27%/year) as compared to post WTO period (1.55 & 1.43%/year), where as it was found positive and non-significant in post WTO period. The fluctuation in production of gram was also more in pre-WTO (23.33%) period as compared to post-WTO period (18.29%).

Table 2. Sustainability yield index

Gram	Pre-WTO Period	Post-WTO Period	Overall
Singh *et al (SYI-I)*	0.340	0.386	0.319
Sahu *et al (SYI-II)*	1.484	1.286	1.571
Pal and Sahu *(SYI-III)*	0.001	0.000	0.001

The productivity of gram has been found to be increased from 561.56 kg/ha. (1979-80) to 971.69 kg/ha. (2010-11) in Madhya Pradesh, showed a relative change of 73.04 per cent with a fluctuation of 18.26 per cent during the period under study. Overall simple (1.54%/year) and compound growth rate (1.63%/year) of gram was found to be positive highly significant in this particular period. The growth of productivity of gram was found positive highly significant in pre-WTO period (2.79 & 2.96%/year) as compared to post WTO period (0.48 & 0.45%/year), where as it was found positive and non-significant in post WTO period. The fluctuation in productivity of gram was also more in pre WTO period (15.55%) as compared to post WTO period (11.71%).

Sustainability Yield Index

The table 2 it is clearly visible that the as per the Singh *et al.* the period 2 shows the sustainable yield, as per the Sahu *et al* the whole period shows the highest sustainable yield. But as per the Pal and Sahu, whole period shows the sustainable productivity. From these infer that gram yield in Madhya Pradesh is maintaining its sustainable level over the period of time.

CONCLUSION

By and large there has been expansion in area, production and yield of gram in Madhya Pradesh. Simple and compound rates positives values indication of all frontiers in area, production and productivity showing increasing trend in all periods. The effect of area expansion clearly visibale of production and productivity of gram in all periods. Also seeing the sustainability index values any one can see that, production and productivity in stable in Madhya Pradesh. Post-WTO period higher sustainability values indicate the advance agriculture technique like fertilizer use, irrigation made positive impact on production and productivity of gram in Madhya Pradesh.

LITERATURE CITED

Anonymous. 2012. *Agricultural Statistics at a Glance*. Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of Madhya Pradesh.

Niranjan; H. K., Gupta, J. K. and Rathi, D. 2015. study of production of major food grain crops in Madhya Pradesh and their yield sustainability. *Life Science Bulletin* – **12** (2): 155-159.

Pal, S. and Sahu. P.K. 2007. On assessment of sustainability of crops and cropping system-some new measures. *Journal of sustainable agriculture*, **31**(3): 43-54.

Sahu, P.K. and Mishra, P. 2013. Modelling and forecasting production behaviour and import- export of total spices in two most populous countries of the world. *Journal of Agriculture Research*, **51** (4): 81-97.

Sahu, P.K.; Kundu, A.L.; Mani, P.K. and Pramanicl, M. 2005. Sustainability of different nutrient combination in a long term rice-wheat cropping system. *Journal of New Seeds,* **7** (3): 91-101.

Received on 17-01-2017 *Accepted on 24-01-2017*