Growth and Instability of Gram Crop in Nagpur Division

S. D. Kathale
P.G. Scholar,
Agricultural Economics and
Statistics Section,
College of Agriculture,
Nagpur

N.V. Shende
Associate Professor,
Agricultural Economics and
Statistics Section,
College of Agriculture,
Nagpur

R.R. Meshram
P.G. Scholars,
Agricultural Economics and
Statistics Section,
College of Agriculture,
Nagpur

Abstract

It was found that the growth rates in area, production and productivity of selected pulses have remained stagnant. District wise analysis show that the district of Nagpur and Wardha registered a significant positive growth rate in the area productivity and production of total pulses. In respect of gram Nagpur district registered positive significant growth rate in area productivity and production.The result indicate that the compound growth rate of area under crop was more over 1.73 per centfor the entire district of all the district and also the Nagpur division as whole during overall period it was proof of the fact that the selected pulses crop was a traditional crop in region as well as Nagpur division hence there is a very big need to concentrate on this crop for policy maker and researcher. The production and productivity instability in selected pulses crop were observed in almost the entire district in the Nagpur division.It overall area and production instability 43.07 and 27.30 per cent respectively of division, It may be because the crop largely depends on vagaries of nature and selected pulses production is subject to fluctuation from year to year and thus, causing heavy losses. Farmer cannotbear risk due to scare resource and small holding. A crop failure means not only the loss of farmer's income but also the loss of investment in the next crop season. This leads farmer to indebtedness.In order to maintain stability in production of pulses concerned efforts should be made in the Nagpur division.In almost all the studied district the yield effect was found to be most responsible factor for increasing production in the Nagpur division. But till there is a scope to increase yield in rain fed farming by introducing new development programme and increasing the technical efficiency at farm level.

Keywords: Growth Rate, Instability, Production, Productivity, Nagpur Division.

Introduction

Gram is the high-value of pulse crop it is most important leguminous food grain, Pulses are the main source of protein for the predominantly vegetarian population of India. They are also used as fodder and concentrate for the cattle. The vital role of pulses in fixation of atmospheric nitrogen needs no emphasis,which in fact, is very crucial in the face of sky rocketing nitrogenous fertilizer prices in our country.In comparison with thegrowth in production of food grains with the advent of Green Revolution, the growth in production of pulses is rather disappointing and has led to a consequential rise in the price of pulses, Gram is the high value of pulses crop that is the most important food grains in the diets of people.

In a developing country like India, agricultural growth leads to a rising demand for products. The process is accelerated by a rapid growth of population accompanied by rising level of income does supply of agricultural products respond to rising demand for them? This question becomes critical and assumes central important and hence calls for the efficient utilization of resource.

Materials and Methods

Selection of crops

For the present study, the major Pulse crop was selected crop viz., Gram

Selection of Period

Based on the objective of the study for the analysis of growth rates, and decomposition, the period was divided into breakup of 15 years and overall as shown below.

Period I	1983-84 to 1997-98
Period II	1998-99 to 2012-13
Overall Period	1983-84 to 2012-13

Nature and Source of Data

Data used for the present study were collected from various published sources. Time series secondary data on the area, production and productivity of gram, and other data were collected from various government published sources.

Analytical Techniques Employed for Analyzing the Data

The present study was based on time series secondary data of gram in Nagpur district. The study was conducted on the following aspects.

Growth Rate Analysis

The compound growth rate of area, production and productivity of gram was estimated for two sub periods as Period I-1983-84 to 1997-98, Period II -1998-99 to 2012-13

The district-wise compound growth rates of area, production and productivity were estimated by using following exponential model.

$$Y = ab^t$$
$$\text{Log } Y = \log a + t \log b$$
$$\text{CGR} = (\text{Antilog } b-1) \times 100$$

Where,

CGR = Compound growth rate
t = time period in year
Y = Area/production/productivity
a&b = Regression parameters.

The t test will applied to test of significance of 'b'

Instability Analysis

To measure the instability in area, production and productivity, an index of instability was used as a measure of variability.

The coefficient of variation (CV) was calculated by using the formula.

$$\text{C.V } (\%) = \frac{Standard\ Deviation}{Mean} \times 100$$

Decomposition of Output Growth

To measure the relative contribution of area, yield to the total output change for the major crops, Minhas (1964), the decomposition analysis model as given below was used. Sharma (1977) redeveloped the model and several research workers (kalamkar et. al., 2002) used this model and studied growth performance of crop in the state. A_o, P_o and Y_o are area, production and productivity in base year and A_n, P_n and Y_n are values of the respective variable in n^{th} year item respectively.

$$P_o = A_o \times Y_o \text{ and}$$
$$P_n = A_n \times Y_n \quad \text{------------------} \quad (1)$$

Where,

A_o and A_n represent the area and Y_o and Y_n represents the yield in the base year and n^{th} year respectively.

$$P_n - P_o = \Delta P$$
$$A_n - A_o = \Delta A$$
$$Y_n - Y_o = \Delta Y \quad \text{------------------} \quad (2)$$

For equation (1) and (2) we can write

$$P_o + \Delta P = (A_o + \Delta A)(Y_o + \Delta Y)$$

Hence,

$$P = \frac{Ao\Delta YYo\Delta A}{\Delta P} \times 100 + \frac{\Delta Y}{\Delta P} \times 100 + \frac{\Delta A}{\Delta P} \times 100$$

Production = Yield effect + area effect + interaction effect

Thus, the total change in production can be decomposed into area effect and the interaction effect due to change in yield and area.

Result and Discussion

The result obtained from the present investigation have been presented in the following sub heads:

Growth Performance of Crop

In this study, the growth in area, production and productivity of Gram was estimated using compound growth rates as indicated in the methodology chapter. In this analysis, the general growth performances of the crop in Nagpur division were examined by fitting exponential growth function with time normalization on area, production and productivity. The growth performance of the crop pertaining to three periods and overall is discussed separately for each district as under.

Growth Rates of Gram

The growth performance of gram pertaining to two period and overall was presented in the table 1, which revealed due to introduction of gram in the region during period-I, the growth rate of area, production and productivity was recorded positive. The highest growth rate for area was registered in Wardha district i.e.10.17 percent per annum followed by Chandrapur (2.75), Nagpur (8.00) district respectively. Also found statistically significant. Whereas, the growth rate were estimated more in period-II for Nagpur (8.27) Bhandara (4.03) and Chandrapur (8.48). However, the growth rates were positive and statistically significant in all the cases.

Table 1
District Wise Compound Growth Rate for Gram

	Particular	Wardha	Nagpur	Bhandara	Chandrapur	Gadchiroli	Nagpur Division
Period-I	Area	10.17**	8.00**	0.68	2.75*	0.02	38.00
	Production	12.05**	7.41**	-1.41	7.75**	11.75**	36.0
	Yield	1.69	1.34	-18.65	-0.14	-2.79	99.99
Period-II	Area	3.61**	8.27**	4.03**	8.48**	-3.71	6.52
	Production	6.59**	12.37**	8.41**	19.92**	-6.01	34.00
	Yield	2.88*	3.42**	14.07**	3.67**	0.75	2.52
Overall Pooled	Area	5.70**	6.23**	-2.79	5.45**	-1.83	23.00
	Production	7.70**	8.06**	-0.51	7.98**	-0.51	1.25
	Yield	1.89	2.81*	2.43*	2.30*	1.38	1.73

Note: ** Significant at 1% level, * Significant at 5% level

The result revealed that productivity of gram was found to be negative in all almost all cases in period-I in Nagpur division except Nagpur (1.34) and Wardha (1.69). It reflects to growth rates of production. However the growth in productivity was recover in period-II. In period-II picture has been change, the growth rate of productivity has been drastically changes, i.e. growth rates were increased

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in period-II positive in all most all the cases in Nagpur division. It shown effect in overall period. The highest growth in production was estimate in Nagpur district 8.06 per cent per annum followed by Chandrapur (7.98) and Wardha (7.70) district respectively.

Instability of Crop

One should not obvious of instability by taking the growth rates only. Because the growth rates will explain only the rate of growth over the period.Whereas, instability will Judge, whether the growth performance is stable or unstable for the period for the pertinent variable.

Instability on Gram

As seen from the Table No.2, that coefficient instability for area under gram in Nagpur district was found lowest i.e. 18.08 per cent followed by Wardha (44.84) district, Bhandara (43.36), Chandrapur (38.31)

district respectively. The coefficient of instability for area under gram were increase in period-II in all the districts in region. However, in overall period of thirty years the coefficient of instability for area under gram was estimated in the range of 38.04 to 54.31 except in Chandrapur (56.70) district. further instability productivity in relation to instability in area was contributed marginality towards production fluctuation, In Nagpur division Wardha and Gadchiroli district has registered highest coefficient of instability in overall as compared to other two period for all variable viz., area, production, productivity. This instability of gram in the in whole Nagpur division was effect of the instability experienced by gram grower, probably due to the introduction of improved gram technology in the farming system, where local varieties also under production.

Table 2
District Wise Instability Indices in Gram

Particular		Wardha	Nagpur	Bhandara	Chandrapur	Gadchiroli	Nagpur Division
		C.V.	C.V.	C.V.	C.V.	C.V.	C.V.
Period-I	Area	44.84	18.08	43.36	38.31	50.67	24.38
	Production	51.75	38.81	53.95	37.79	36.60	39.09
	Yield	31.20	25.67	28.28	42.99	32.36	25.87
Period-II	Area	57.90	33.17	58.77	69.28	53.45	33.53
	Production	63.05	40.21	45.18	75.62	31.05	47.63
	Yield	35.18	23.78	37.60	41.64	34.73	19.40
Overall Pooled	Area	50.84	26.11	54.31	56.70	38.04	43.07
	Production	56.43	44.83	57.45	56.33	21.81	65.63
	Yield	39.56	27.76	35.64	46.16	31.94	27.30

CV = Coefficient of variation

All the district of the Nagpur division had shown highest yield instability than area instability and likewise they contribute toward production fluctuation.

Decomposition Analysis

A quantitative assessment of contribution of the various factors to production in the districts of Nagpur division is helpful in reorienting the programmes and setting priorities of agricultural development so as to achieve higher growth rates of agricultural production. There are many factors which affect the growth of crop output. These factors believed to affect the production of crop viz., area, yield and their interaction have been considered in the present study. The result of decomposition scheme

was worked for two equally divided sub period and overall period as pooled of 30 years data.

Decomposition Rate of Gram

In the Table No.3, that the area effect was a most responsible factor for increasing the production of gram over a period of time a magnitude of 22.72 to 74.42 In almost all district in the region except Bhandara and Wardha district in the period-I, however these effect contributed positively in increasing gram production for whole Nagpur division however, these contribution was distributed with yield effect and Interaction effect in the period-II for all most all the district. In the overall period of 30-years the similar trends were observed in all districts except Bhandara district.

Table3
Percent Contribution of Area, Yield and Their Interaction for Increasing Production of Gram

Particular		Wardha	Nagpur	Bhandara	Chandrapur	Gadchiroli	Nagpur Division
Period – I	Area effect	74.42	46.95	1.04	55.00	22.72	129.09
	Yield effect	8.22	28.07	99.59	30.18	82.89	-18.49
	Interaction effect	17.33	24.98	-0.94	15.66	-6.39	-12.26
Period- II	Area effect	44.09	49.56	8.55	52.35	115.43	45.07
	Yield effect	32.48	21.62	69.52	20.00	-28.16	27.41
	Interaction effect	23.42	28.87	22.07	27.47	12.95	27.23
Overall Pooled	Area effect	44.91	38.40	23636.04	46.90	203.70	47.47
	Yield effect	11.85	12.60	-35518.02	14.30	-166.13	16.27
	Interaction effect	43.24	48.84	11981.98	38.95	63.83	35.94

Conclusions

Thus it is concluded from the above study that Compound growth rate for Area and production under pulses has decreased in all the district of In Nagpur division, the study period of the area, production and productivity instability in gram was observed in almost all districts in the division. It may

be because the crop largely depends on vagaries of nature which causes heavy losses. Percent contribution of area effect was more responsible for pulses production in the initial period but later yield effect was more pronounced the crop, gram is the major crop grown in all the district in the Nagpur division. It is very rarely taken a sole crop, mostly on

inferior land.Gram crops generally grown in rabi season and mostly on depend on soil moisture as far as water is concern. Therefore gram productivity keeps fluctuating heavily from year to year.growth in production and productivity of gram crops was positive during overall period.

Implications

The production and productivity instability in gram crop was observed in all most entire district in the Nagpur division: It may be because the crop largely depend on vagaries of nature and production is subject to fluctuation from year to year and thus, causing heavy losses. Farmer cannot bear risk due to scare resource and small holding. In order to maintain stability in production of gram concerned efforts should be made in the Nagpur division.

1. Gram appeared to be the important ace in the cropping pattern of Nagpur division Hence there is a very big need to concentrate on this crops for policy maker and researcher.
2. In almost all the studied district the area effect was found to be most responsible factor for increasing production in the overall period. But till there is a scope to increase yield in rain fed farming by introducing new development programme and increase the technical efficiency at farm level.
3. Farmer's need to be protected by crop insurance coverage against yield availability of pulses.

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