

AN ANALYSIS OF GROWTH TRENDS OF PRINCIPAL CROPS IN INDIA

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ABSTRACT

The study was undertaken to examine the growth in area, production and yield of principal crops in India over the period of 49 years (1949-50 to 1997-98). The growth rates were worked out for major crops by using exponential function. The magnitude of variability was calculated through the coefficient of variability and contribution of area and productivity to increase in production was worked out by using decomposition analysis. From study it is observed that the growth rates of area, production and yield of principal crops in India over the period were positive and significant. High growth in production accompanied by increased variability in production, thus increasing variability in production, and the risks associated with the production of these crops. The yield effect was the most important factor for an increase in production of rice, jowar, bajra, maize, gram, cotton and sugarcane. Contribution of area has a major role in increasing production of tur and oilseeds while wheat recorded highest interaction effect of area and yield towards increase in production.

During the last three decades there has been considerable increase in the output of many agricultural commodities in India. This is largely due to the green revolution which has brought in a palpable increase in the yields of many crops. In a country like India, where agriculture continues to contribute significantly to the national economy, any improvement in the overall growth of agricultural output is likely to improve the standards of mass of consumption. An analysis of the behavior of agricultural production in the past and estimates of its growth rates can provide a basis for future projection of agricultural output (Sharma 1977). This paper therefore endeavors to analyze the changes, trends and growth in area under cultivation, production and productivity as also contribution of different elements to the growth of major crops output in India. Besides, attempt has been made to analyze the magnitude of instability for each crop. Studies conducted elsewhere in our country with regards to decomposition analysis by Minhas (1964), Bastine and Palanisami (1994), Mundinamani *et al.* (1995) have revealed different magnitude of contribution of the growth of output by area, yield and interaction effect.

Time series secondary data on area, production and productivity for major crops *viz.*, paddy, jowar, bajra, maize, wheat, tur, gram, cotton and sugarcane and oilseeds grown in India were collected and compiled for the period from 1949-50 to 1997-98 (49 years). The data were collected from Agricultural Statistics at a Glance (1999), Ministry of Agriculture, New Delhi.

Compound growth rates were estimated with the following exponential function

$$Y = A B^T$$

Where,

Y = area/production/yield of crop

A = intercept

B = regression coefficient

T = time variable

B = $r + 1$

Compound growth rate = $(\text{Antilog } (\log b) - 1) \times 100$

The compound growth rates were tested for their significance by the student 't' test.

The magnitude of instability for each crop area, production and productivity was calculated through the coefficient of variation (CV)

as under.

$$CV = \text{Standard deviation}/\text{Mean value} \times 100$$

To know the contribution of area and productivity to incremental production for various foodgrain crops, the model suggested by Sharma(1977) and Narula and Vidyasagar (1973) was used. The form of the model is :

$$\Delta P = \Delta AY_0 + \Delta YA_0 + \Delta A\Delta Y$$

Where,

- ΔP = Change in production,
- ΔAY_0 = Area Effect
- ΔYA_0 = Yield Effect , and
- $\Delta A\Delta Y$ = Interaction Effect (change in production due to change in area and yield together.)

For this purpose, average area and productivity of first triennium was taken as a base and it was compared with the averages of last triennium in the respective periods.

Table 1 shows the crop-wise growth rates of area, production and productivity of major crops in India for the period 1949-50 to 1997-98. It is evident from the table that wheat production experienced the highest growth of 5.51 per cent per annum with area and yield contributing 2.21 and 3.23 per cent respectively, whereas rice crop recorded growth rate of 2.77 per cent in production. The contribution of productivity was slightly higher than that of area. Jowar production recorded a growth rate of 0.93 per cent which was results of increase in productivity. The area under this crop rather declined. Same contribution observed in the case of bajra production (1.70 per cent) . The maize production showed growth rate of 3.02 per cent which has primarily resulted from increase in productivity while total food grains production increase was at the rate of 2.72 per cent per annum. Among pulses, tur recorded the highest growth rate of productivity (1.22 per cent) resulting from increase in acreage (1.04 per cent) whereas, gram production was increase at the rate of

0.09 per cent which was result of yield. Oil-seeds production increased at the growth rate of 3.08 per cent. The production of cotton experienced a growth rate of 2.50 per cent and this increased production has been mainly as a result of growth in productivity, which was 2.22 per cent where area contribution has been only 0.28 per cent per annum. Sugarcane production registered a growth rate of 3.52 per cent and this has occurred as a result of increase in area and yield.

The coefficient of variation (CV) was used as the measure of instability in the production of major crops of India. The Table 2 shows that the production instability was of a higher order for crops like wheat, maize, oil-seeds, cotton and sugarcane (CV worth than 37 per cent) and of lower of in other remaining crops (CV ranging from 3.98 per cent in bajra to 22.02 per cent in tur. The highest CV of production was noticed in wheat. Thus the highest CV of production increased with rapid growth of production. In other words, high growth in production accompanied by increase variability in production, thus increasing variability in production, thus increasing the risks associated with the production of these crops. The area instability was high in the case of wheat, oilseeds and sugarcane and the productivity coefficient of variation was high in case of wheat, bajra and cotton.

The relative contribution of area, yield and there interaction to changes in production of individual crop are presented in Table 3. It could be seen from the table that yield effect was most responsible factor for an increase in production of rice (59.33 per cent), jowar (200.70 per cent), bajra (93.30 per cent), maize (41.51 per cent), gram (172.10 per cent), cotton (51.82 per cent) and sugarcane (45.08 per cent). Contribution of area has a major role in increasing production of tur (100.28 per cent) and oilseeds(41.12 per cent) while increase in wheat recorded was mainly

Table 1. Compound Growth rates of area, production and yield of major crops in India (1949-50 to 1997-98)

Crop	Area	Production	Yield
Rice	0.76**	2.77**	1.99**
Wheat	2.21**	5.51**	3.23**
Jowar	-0.70**	0.93**	1.65**
Bajra	-0.15	1.70**	1.86**
Maize	1.22**	3.02**	1.78**
Foodgrains	0.41**	2.72**	2.30**
Gram	-0.64**	0.09	0.73**
Tur	1.04**	1.22**	0.16
Pulses	0.14	0.64**	0.50**
Oilseeds	1.80**	3.08**	1.25**
Cotton	0.28**	2.50**	2.22**
Sugarcane	1.82**	3.52**	1.68**

* Significant at 5% level

** Significant at 1% level.

Table 2. Coefficient of Variations for area, production and yield of major crops in India (1949-50 to 1997-98)

Crop	Area	Production	Yield
Rice	10.94	39.36	29.60
Wheat	29.90	67.43	44.69
Jowar	12.69	19.35	26.20
Bajra	9.49	3.98	34.38
Maize	18.04	40.00	27.15
Foodgrains	7.12	37.90	33.90
Gram	14.10	17.50	15.00
Tur	16.69	22.02	12.66
Pulses	5.91	14.09	11.20
Oilseeds	27.00	50.94	22.48
Cotton	9.49	37.65	34.08
Sugarcane	26.14	46.82	23.39

Table 3. Decomposition of output growth of major crops

Crop	Yield effect	Area effect	Interaction effect
Rice	59.33	15.71	24.96
Wheat	30.64	17.92	51.44
Jowar	200.7	-44.62	-56.09
Bajra	93.31	2.60	4.09
Maize	41.51	21.04	37.45
Foodgrains	71.6	9.86	18.54
Gram	112.1	-7.41	-4.69
Tur	-0.18	100.28	-0.10
Pulses	59.63	29.81	10.56
Oilseeds	24.22	41.12	34.66
Cotton	51.82	19.31	28.88
Sugarcane	45.08	26.92	28.00

due interaction effect of area and yield (51.44 per cent) i.e due to change in area and yield together towards increase in production of that crop. In case of jowar and gram, contribution of yield effect was so high that it could offset the negative effect of area and its interaction. In general, the yield effect was higher than the area effect which explains that due to use of

high yielding varieties.

CONCLUSION

It may be concluded from the study that area under jowar, bajra and gram declined over a period of time while all other crops recorded increase in area. Production and productivity of all crops increased positively and significantly. Generally the variability of production

was more than the variability in area and yield.

The results of decomposition analysis cleared that increase in yield was the major factor in increased production of rice, wheat, jowar, bajra, maize, gram, cotton and sugarcane while increased production of tur and gram was due to expansion in area.

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