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Instability in turmeric (*Curcuma longa* L.) production in India

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Abstract

The factors responsible for the instability in turmeric (*Curcuma longa*) production in India were studied. Instability analysis showed that yield instability increased marginally in the eighties. However, the decrease in area instability more than compensated for the increase in yield instablitity resulting in reduction of production instability. Decomposition analysis showed that yield instability was the dominant factor affecting production instability. Therefore future development programmes should envisage stabilisation of yield which will stabilise production. The yield instability could be reduced by investing on research towards evolving of cultivars suitable for existing agroclimatic conditions.

Key words : *Curcuma longa,* production, yield.

Introduction

India is the largest producer and exporter of turmeric (*Curcuma longa* L.) in the world. Apart from its use as a spice, turmeric is also used in pharmaceutical, confectionary and food industries. The major turmeric producing states in India are Andhra Pradesh, Tamil Nadu, Orissa, Maharashtra, Kerala and Assam which account for more than 75 per cent of the turmeric produced in the country (Table 1).

Though production of turmeric has increased over the years, one disquieting feature is the sharp year-to-year fluctuation in production. The instability in production tends to be transmitted to the markets causing wide fluctuations in the price of the produce. Therefore, apart from increasing production, stability in production is also important for planning for agricultural development. A pre-requisite of stabilising turmeric production is the measurement and identification of factors or sources of instability. In the present study, an attempt has been made to find out the factors responsible for instability in turmeric production in India.

Materials and methods

Secondary data compiled from official publications of the Spices Board, Kochi

Table 1. Production of turmeric in major producing states (in '000 t)

Year	Andhra Pradesh	Tamil Nadu	Orissa	Mahara-shtra	Kerala	Assam	All India
1970-71	56.2	41.3	15.5	12.7	5.3	2.6	150.6
1971-72	91.5	32.6	14.2	11.5	4.4	2.8	178.4
1972-73	35.3	35.0	13.9	8.5	4.4	2.8	121.1
1973-74	37.4	42.1	14.7	14.2	4.6	3.1	133.9
1974-75	59.4	27.9	11.5	14.9	4.5	3.4	145.7
1975-76	49.1	35.1	12.1	13.6	2.6	3.5	135.2
1976-77	35.0	26.1	10.6	13.7	2.2	3.6	109.7
1977-78	41.3	30.0	12.9	15.6	3.5	4.1	126.3
1978-79	75.3	55.8	15.2	15.3	3.6	4.3	190.4
1979-80	84.8	84.1	14.3	14.5	7.2	4.6	235.4
1980-81	71.9	67.5	31.5	11.7	7.7	4.9	216.9
1981-82	74.2	48.7	21.5	13.0	6.1	4.9	191.3
1982-83	71.0	35.9	22.2	13.2	5.2	5.0	173.1
1983-84	80.1	47.6	35.4	12.5	5.8	5.3	212.5
1984-85	79.2	85.3	41.0	12.9	5.2	5.1	259.2
1985-86	132.7	142.9	31.6	12.7	6.2	5.6	367.1
1986-87	127.4	103.6	27.7	9.1	6.3	4.4	319.9
1987-88	123.6	93.5	24.7	7.2	6.2	5.6	303.9
1988-89	158.5	87.9	30.4	7.0	5.9	5.4	390.4
1989-90	173.4	69.1	30.4	10.2	5.4	5.2	389.5

Source : Spices Statistics 1993, Spices Board, Kochi.

were used in the present study. The study period 1970-71 to 1989-90 was divided into two sub - periods namely, 1970-71 to 1979-80 and 1980-81 to 1989-90. The study period was divided as such since high yielding planting materials were available for commercial use in the eighties. Hence the instability measures in the second period will capture the effect of new technology.

Instability is defined as the fluctuations around the trend curve (Boyce 1987). The instability in turmeric production was worked out in the present study using the Mac Bean Index (Mac Bean 1966) which is based on moving averages. Mac Bean Index is defined as :

$$MBI = \frac{100}{n-4} \sum_{t=3}^{n-2} (|X_t - MA_t|/MA_t)$$

where X_t is the variable under consideration and MA_t is the five year moving average of the X_t values centered on year t. It was attempted to test the hypothesis that instability, particularly in yield and production, is increasing in recent times because of introduction of high yielding varieties (Sen 1967). This was done through an intertemporal analysis of instability patterns. Mac Bean indices for area, production and yield per hectare were calculated for the two sub-periods and a comparison was made. The magnitude of the indices gives an indication of the magnitude of

instability during the period under consideration.

Production instability reflects, in addition to acreage variability, yield variability and also effects of area changes on yield levels and effects of yield changes on area under cultivation. For example, yield levels decline as a result of bringing in marginal lands. The production variability is decomposed into its components namely, variability in area, yield variability and the covariance between the two.

Consider the equation

$P = A \times Y$ (1)

where P is production, A is area and Y is yield per hectare. Taking logarithms and computing the variance,

$\text{Var}(\ln P) = \text{Var}(\ln A) + \text{Var}(\ln Y) + 2\,\text{Cov}(\ln A, \ln Y)$ (2)

The variance of area and yield are divided by Var (ln P) and are expressed as percentages. The covariance term, positive or negative, reflects the extent to which area and yield movements are mutually reinforcing or offsetting. This exercise has been carried out for each period.

Results and discussion

The Mac Bean Indices of instability for area in the second period was lower than in the first period. The only exception to this trend was Maharashtra. Though production instability was slightly higher in the first period at the national level, state-wise analysis shows a mixed pattern. Yield instability was comparatively higher in the second period at the national level as well as in Andhra Pradesh, Tamil Nadu, Maharashtra and Kerala. Orissa and Assam experienced a reverse trend. The analysis shows that instability in yield increased marginally during the second period. However, the decrease in area instability more than compensated for the increase in yield instability resulting in reduction of production instability (Table 1).

Analysis of the contribution of each component to output variance revealed that at the national level, the contribution of the variance of yield increased

Table 2. Mac Bean Indices of instability of area, production and yield in turmeric

State	1970-71 to 1979-80			1980-81 to 1989-90		
	Area	Production	Yield	Area	Production	Yield
Andhra Pradesh	12.97	29.43	17.01	6.52	11.95	9.54
Tamil Nadu	17.13	18.25	9.64	17.05	21.94	8.75
Orissa	4.58	6.25	9.31	3.26	16.73	15.32
Maharashtra	6.26	13.07	7.39	7.75	9.94	3.04
Kerala	6.40	17.82	5.94	5.07	6.32	2.11
Assam	2.45	2.82	0.67	2.36	5.63	4.71
All India	6.66	13.87	8.25	4.12	12.40	8.49

Table 3. Decomposition of production instability in turmeric

State	1970-71 to 1979-80			1980-81 to 1989-90		
	Area effect	Yield effect	Inter-action effect	Area effect	Yield effect	Inter-action effect
Andhra Pradesh	32.51	36.65	30.84	54.75	25.97	19.28
Tamil Nadu	85.83	14.26	-0.09	43.85	24.07	32.08
Orissa	309.76	446.32	-656.07	5.84	93.86	0.29
Maharashtra	26.62	75.40	-2.02	25.38	42.36	32.26
Kerala	42.30	34.64	23.06	71.12	10.32	18.56
Assam	94.03	0.24	5.73	43.82	100.88	-44.70
All India	32.59	27.23	40.17	16.07	39.03	44.90

while that of area declined. The covariance term is positive tending to suggest that the combined forces of area and yield have affected the output instability in the same direction across time periods. Regarding disaggregated state level analysis, this national tendency is seen in Tamil Nadu, Orissa and Assam. As against the above mentioned trend in the case of Andhra Pradesh and Kerala, the contribution of variance of yield declined while that of area increased. The covariance term was significantly negative only in Assam during the second period. The positive sign of the covariance term in most of the states during both the sub periods suggest that both area and yield are moving together in the same direction and their interaction effect is quite pronounced, term was significantly negative only in Assam during the second period. The positive sign of the covariance term in most of the states during both the sub periods suggests that both area and yield are moving together in the same direction and their interaction effect is quite pronounced and mutally reinforcing (Table 3).

Decomposition analysis showed that yield instability is the dominant factor affecting production instability. Therefore, future development programmes should envisage stabilisation of yield which will in turn stabilise production. The yield instability could be reduced by investing on research towards evolving of cultivars suitable for the existing agro-climatic conditions. Since a large time lag is involved in producing results, buffer stock policy is to be introduced as an immediate safeguard against production instability and hence price instability.

References

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