Growth Trends in Area, Production and Productivity of Arecanut in India

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Introduction

Arecanut is an important commercial crop in India. It is estimated that nearly six million people depend on arecanut industry for their livelihood in India. The economic produce is the fruit called "betel nut" and is used mainly for masticatory purposes. Arecanut has uses in ayurvedic and veterinary medicines also. Arecanut is grown principally in the hot and humid regions of the world.

The current production of arecanut in the world is about 0.727 million tones from an area of 0.589 million hectares. India is the largest producer and consumer of arecanut in the world with a share of 60 per cent of the total production. It occupies about 62 per cent of the total area under arecanut in the world. The current average yield of arecanut in India is 1203 Kg/Ha which is slightly lower than the world average yield of 1236Kg/Ha. The arecanut yield is highest in China at 2874 Kg/Ha followed by 1688Kg/Ha in Thailand and 1625Kg/Ha in Malaysia. India ranks fifth with 1203 Kg/Ha.

Karnataka, Kerala, Assam, Meghalaya and West Bengal are the major arecanut growing states in India.

The bulk of arecanut production is consumed within the country. However a small quantity of it is exported in processed form or other products like panmasala, scented supari and gutka. In this paper we have discussed the spatial and temporal changes in area, production and productivity of arecanut in India.

Data and Method

Time series data on area, production, productivity and price of arecanut have been obtained from various sources such as Directorate of Economics & Statistics, CMIE (Indian Harvest) and FAO. The present study is conducted for all major arecanut growing states pertaining to the period 1971 to 2004. The entire study period is split into three sub periods to evaluate the spatial and temporal changes of area, production and productivity. The sub periods are Period-I : 1971-1980; Period-II: 1981-1990; Period-III: 1991-2004 and the Overall Period: 1971-2004.

Trend : The trend is usually obtained by assuming some parametric function of time for a given time series data and the trend parameters are estimated by the method of least squares. In many situations, we may not know the exact form of the trend function or sometimes there may not be any suitable parametric functional form to represent the time series data. In such situations, data driven techniques which do not require any advance information about the form of the function is more useful and it is robust against assumptions. The shape of the trend function is obtained from the data itself. Here the only assumption about the form of the function is that it is smooth and continuous. The smooth trend function is estimated using the following model $y_t=m(t)+\varepsilon_t$ where y_t is the observation at time t, m(t) is the trend function assumed to be smooth and ε_t is the error term. The kernel weighted local linear regression smoother (Fan, 1992) is used for the estimation of trend function m.

Growth rate : Compound growth rate of area, production and productivity of arecanut in the major arecanut growing states for different periods are estimated to see the temporal changes. The compound growth rates are estimated using the following exponential model

$$y_t=ab^t$$

$$\ln(y^t)=\ln(a)+t\ln(b)$$

The value of b is estimated by the method of least squares and (b-1) is the estimate for the compound growth rate.

Decomposition analysis : The component analysis model suggested by Minhas and Vidhyanathan (1965) is used to measure the relative contribution of area and yield to the change in production. Sharma (1977) redeveloped the model and several research workers used this model for growth studies (see Narula and Vidyasagar, 1973; Singh and Sissodia, 1989 and Siju and Kombairaju, 2001). In the decomposition analysis, the change in production is taken as the effect of three factors such as yield effect, area effect and interaction effect as follows

Change in production=Yield effect+Area effect+Interaction effect

ie,

$$\Delta P=A_0\Delta Y+Y_0\Delta A+\Delta A\Delta Y$$

where ΔP, ΔY and ΔA are the change in production, yield and area and A_0 and Y_0 are the base year's area and yield respectively.

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Trend in Area, Production and Productivity of Arecanut in India

Both area and production of arecanut in India have increased tremendously during the last three decades. The area under arecanut in India has increased from 0.167 million hectares during 1971 to 0.365 million hectares by the year 2004 with an overall growth rate of 2.2 per cent. During the same period the production has increased more than 3 times from 0.141 million tones to 0.439 million tones with a growth rate of 3.2 per cent. The trend functions of area and production of arecanut in India from 1971 to 2004 are given in figure 1. Both the area and production of arecanut in India increased mainly during the period III (1991-2004). During this period the area was increased from 0.217 million hectares to 0.365 million hectares and the production was increased from 0.238 million tones to 0.439 million tones. It can be noted from the table 2 that the compound growth rate of area and production of arecanut in India was high during the period III (1991-2004) compared to the previous two decades. This is mainly due to the favourable price prevailed during this period (Fig. 2). The overall average yield per hectare has improved from 843 Kg/Ha during 1971 to 1203 Kg/Ha by the year 2004.

The decomposition analysis (Table-3) shows that the increase in production during the period from 1971 to 1980 was mainly due to the increase in yield and the increase during the period between 1981 to 1990 is the effect of both area and yield. The increase in production after 1990 is due to the increase in area and the effect of yield is negligible.

The time series data on arecanut price (Fig.-2) shows that there was a sudden increase in arecanut price from the year 1989 and the price reached the maximum during 1999-2000. The price started declining after the year 2000. There were only marginal changes in arecanut price during the period from 1971 to 1988.

Conclusion

Arecanut is one of the most important plantation crops in the country. It is mainly cultivated in the southern and north-eastern parts of the country. Karnataka, Kerala and Assam are the three major arecanut growing states in India. These three states together produces about 85 per cent of total arecanut production and occupies about 89 per cent of total area under arecanut in India. West Bengal and Meghalaya are the other two major arecanut growing states. During the last 35 years, the area under arecanut in the country has increased more than two times and the production increased more than three times. The rate of increase in both area and production are very high during the last 15 years mainly due to the favourable price prevailed during this period. Because of the higher price, people started expanding the arecanut cultivation irrespective of the suitability of the area. This led to increased problems in arecanut cultivation leading to possible excess production resulting in the steep price fall. Also the productivity in most of the states becomes stagnant after 1990. In the present context of WTO, there is an urgent need to increase the productivity of arecanut to increase the net return per unit area otherwise it is difficult to sustain arecanut cultivation over a period of time. The expert committee constituted by the Government of India under the Chairmanship of Dr. P.Rethinam examined various issues related to arecanut and has opined that further area expansion of arecanut is to be controlled, since arecanut has no major alternate use other than masticatory purposes (Rethinam and Sivaraman, 2001). To increase income from unit area of land in the existing arecanut plantations, crop diversification with inter and mixed cropping is to be encouraged.

TABLE 1—STATE WISE AREA AND PRODUCTION OF ARECANUT IN INDIA

	Area ('000Ha)					Production ('000MT)				
State/UT	1971	1981	1991	2001	2004	1971	1981	1991	2001	2004
A & N Islands	NA	NA	3.1	4.4	4.4	NA	NA	4.7	7.2	6.7
Andhra Pradesh	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2
Assam	23.1	50.8	66.0	73.2	74.0	25.1	49.8	50.5	68.3	69.5
Goa	1.4	1.4	1.3	1.6	1.6	1.3	1.3	1.5	2.5	2.7
Karnataka	41.0	54.4	63.6	119.0	149.1	50.4	78.3	93.0	162.8	199.1
Kerala	85.8	60.9	64.8	87.4	102.5	53.0	53.2	66.5	88.0	105.5
Maharashtra	2.3	2.1	1.9	2.2	2.3	3.2	2.5	2.5	4.4	4.6
Meghalaya	6.3	6.5	6.1	11.2	11.2	4.2	4.9	5.2	13.7	14.2
Mizoram	NA	0.3	0.1	1.0	2.0	NA	0.1	0.2	1.8	5.3
Pondicherry	NA	NA	0.1	0.1	0.1	NA	NA	0.1	0.1	0.1
Tamil Nadu	4.0	4.3	2.7	3.7	5.2	2.8	3.0	3.9	4.8	4.9
Tripura	NA	0.6	1.3	3.2	3.4	NA	0.4	2.3	6.8	6.9
West Bengal	3.1	3.1	5.9	7.8	9.2	2.8	2.8	7.9	12.2	18.5
India	167.3	184.5	217.0	290.0	365.5	141.0	196.0	238.0	379.2	439.3

TABLE 2—COMPOUND GROWTH RATE (%) OF AREA, PRODUCTION AND PRODUCTIVITY OF ARECANUT

Item	Period	Assam	Karnataka	Kerala	Meghalaya	WB	All India
Area	I	8.7	2.6	-4.8	0.8	0.0	0.3
	II	3.0	1.5	0.2	-0.6	7.2	1.5
	III	0.8	7.2	3.6	3.2	3.6	4.2
	Overall	3.4	3.3	0.3	2.0	4.1	2.2
Production	I	7.3	4.5	-0.7	1.0	0.0	3.0
	II	2.0	1.7	1.9	3.1	13.8	2.5
	III	1.3	6.5	3.2	5.6	6.4	4.8
	Overall	2.1	3.4	2.4	3.9	6.7	3.2
Productivity	I	-1.3	1.8	4.4	1.1	0.0	2.7
	II	-1.0	0.2	1.7	2.3	6.2	0.9
	III	0.5	-0.6	-0.4	2.3	2.8	0.6
	Overall	-1.2	0.1	2.1	1.9	2.4	1.0

TABLE 3—DECOMPOSITION ANALYSIS

State	Effect	Period-I		Period-II		Period-III		Overall	
		actual	%	actual	%	actual	%	actual	%
Assam	ΔP	24.7	100	8.2	100	7.0	100	39.9	100
	area	30.1	122	12.1	147	10.0	143	55.3	139
	yield	-2.5	-10	-3.1	-38	-2.6	-37	-4.8	-12
	interaction	-2.9	-12	-0.8	-9	-0.4	-6	-10.6	-27
Karnataka	ΔP	26.8	100	14.7	100	108.1	100	149.6	100
	area	14.9	56	14.2	96	118.7	110	126.6	85
	yield	9.2	34	0.4	3	-4.6	-4	6.5	4
	interaction	2.7	10	0.1	1	-6.0	-6	16.4	11
Kerala	ΔP	3.0	100	10.0	100	40.0	100	53.0	100
	area	-15.4	-513	1.9	19	40.9	102	10.0	19
	yield	25.9	863	7.8	78	-0.5	-1	36.2	68
	interaction	-7.5	-251	0.3	3	-0.3	-1	6.8	13
Meghalaya	ΔP	-3.3	100	5.3	100	8.0	100	10.0	100
	area	0.1	-4	-0.1	-1	5.2	65	3.3	33
	yield	-3.3	101	5.7	108	1.5	19	3.8	38
	interaction	-0.1	3	-0.4	-7	1.3	16	2.9	29
West Bengal	ΔP	NA	NA	4.2	100	11.5	100	15.7	100
	area	NA	NA	2.0	47	5.2	45	5.5	35
	yield	NA	NA	1.3	31	3.7	32	3.4	22
	interaction	NA	NA	0.9	22	2.7	23	6.8	43
India	ΔP	48.5	100	51.5	100	198.0	100	298.0	100
	area	13.5	28	27.6	54	177.9	90	166.6	56
	yield	32.0	66	20.9	41	11.6	6	60.2	20
	interaction	3.1	6	3.0	6	8.5	4	71.2	24

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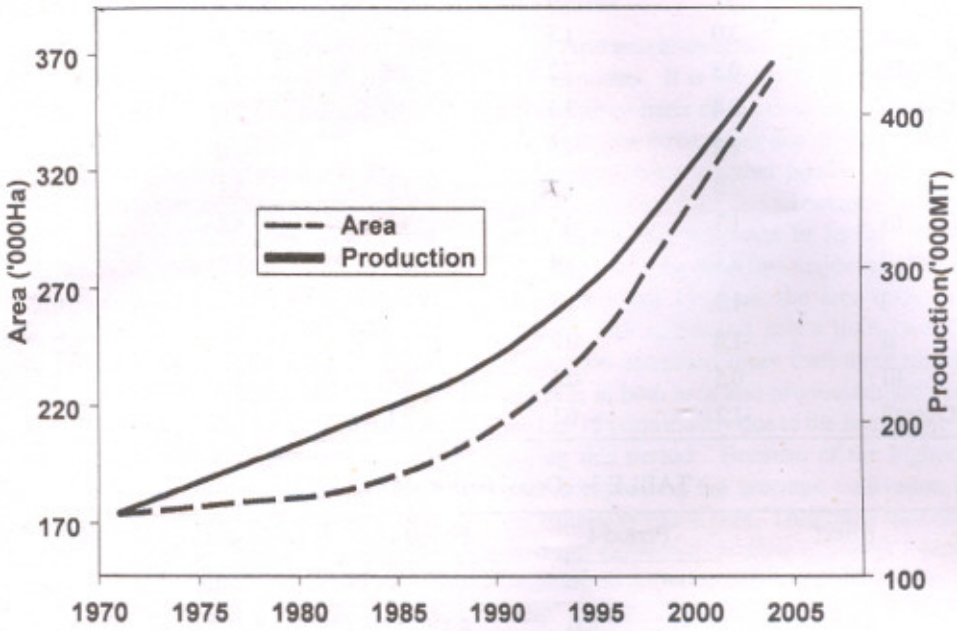

Fig. 1 Trend functions of area and production of arecanut in India

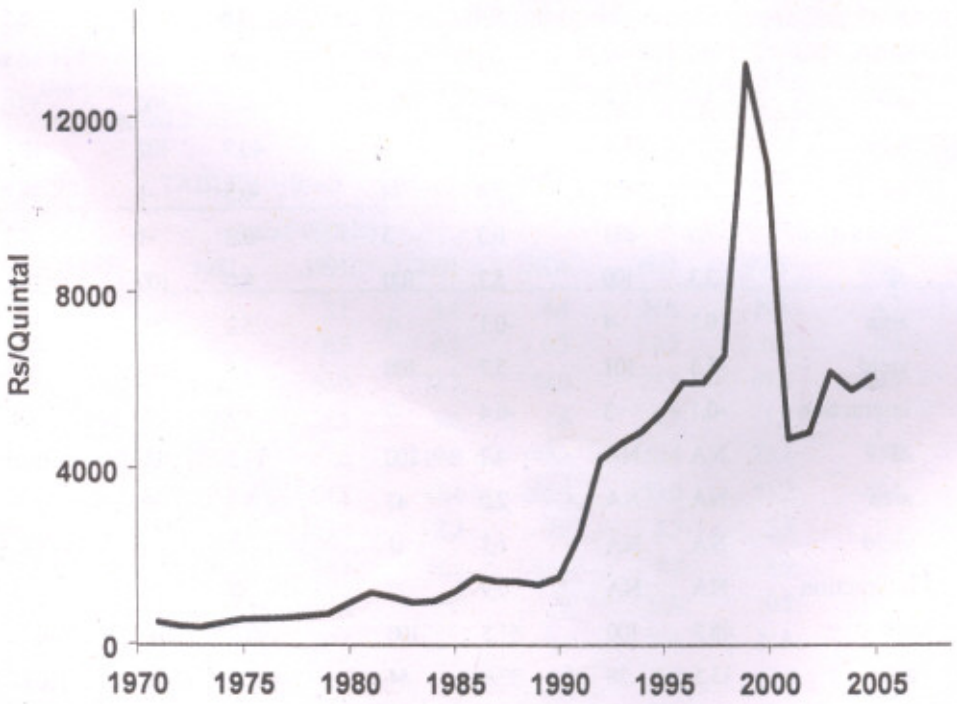

Fig. 2 Trend in arecanut price in India

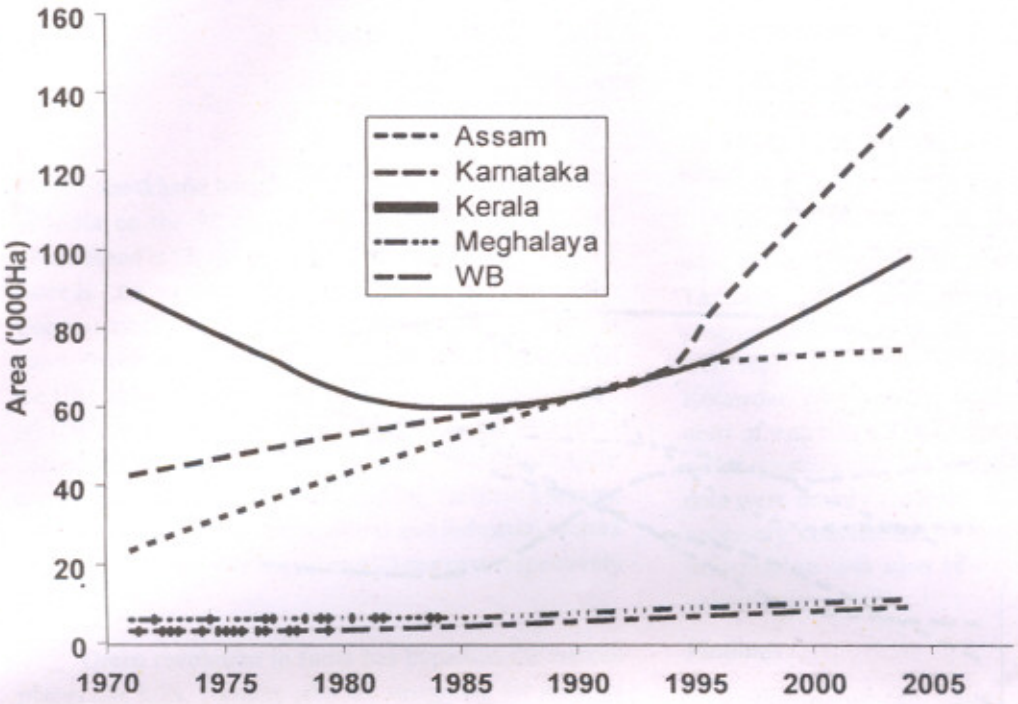

Fig. 3 Trend functions of area under arecanut (Major Sates)

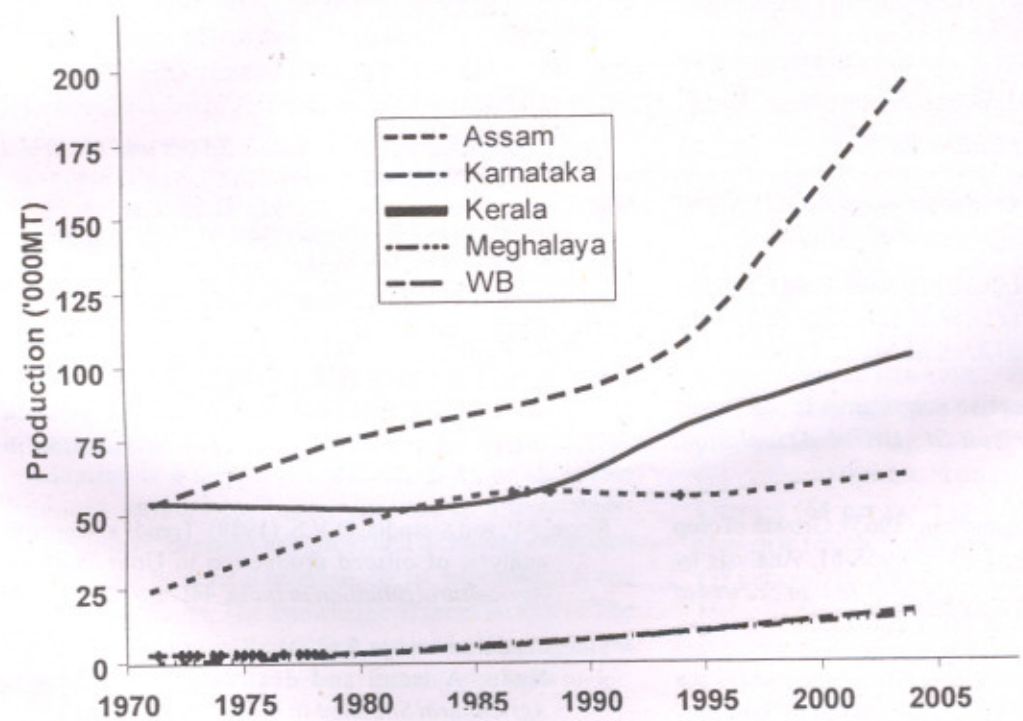

Fig. 4 Trend functions of production of arecanut (Major Sates)