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Cocoa economy: An international perspective with special reference to Indian scenario

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Abstract

Global cocoa production is concentrated in few countries, where four West African countries contribute 70% of global production. From Asian region, Indonesia has competitive advantage of low cost of production and high yields (1000Kg/ha). Over the last 26 years world cocoa production grew at a compound growth rate of 3.6%. The increase in production during the period was 1.55 million tons with 65% area effect and 21% yield effect. Western Europe and Northern America together consume 2/3rd of global cocoa production. The time series analysis of cocoa prices reveals a regular cyclical pattern of price movement resulting from structural deficits and surpluses of cocoa bean stocks. India produces just 0.32% of global cocoa production. The estimated acreage response function revealed that weighed average of lagged cocoa prices and price risk (a measure of standard deviation of cocoa prices) had significant impact on area allocation with supply elasticities 0.38 and –0.042 respectively. India is a high potential market for chocolates. There is a large untapped potential in urban markets alone. The market growth of chocolate segment in the country is 15%. The cocoa industry's processing capacity is more than the present domestic production. Even then, any area expansion should be taken up with adequate precaution because the international prices are highly fluctuating and there does not exist any price support mechanism for cocoa in the country.

Key words: Cocoa scenario, time series analysis, area effect, yield effect

Introduction

Global production of cocoa is 3.1 million tons (ICCO, 2003). Cocoa production is mainly concentrated in West Africa, Latin America and Southeast Asia. West Africa is the major producing region with 70% share of world production, where Ivory Coast accounts for around 40% of world output. Latin American share is 13%, while Asian production has expanded rapidly since 1970s and now accounts for around 17% of global output. Two-thirds of cocoa bean production is used to make chocolate and one third to make cocoa powder. Western Europe and Northern America consume two-thirds of cocoa products. The recent consumption growth rate in Asian and Latin American countries is impressive. World cocoa market is characterized by cycles of price boom and price fall. These cycles are sufficiently persistent to affect the steady growth of cocoa production and consumption. India produces 10,000 tons of cocoa beans from 17,800 hectares of land, while the cocoa industry in the country has a processing capacity of 30,000 tons. The growth potential of cocoa products in India is very high. Presently the Indian chocolate market is growing at 15% per annum. The present study covers four broad aspects.

1) Global cocoa production scenario
2) Global cocoa consumption scenario
3) Time series analysis of International cocoa prices.
4) Cocoa production and consumption scenario in India.

Data and Methodology

Time series data on area, production and prices of major cocoa producing countries was obtained from FAO database and ICCO quarterly bulletins. Data on area and production in India is obtained from Directorate of Cashew and Cocoa Development, Cochin. The data on

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production has been classified into different periods based on observed shifts. The differential growth rates in various periods are substantiated based on available literature, observations and assumptions.

The global production scenario has been analyzed based on seven major cocoa producing countries in the world.*viz,* Ivory Coast, Ghana, Nigeria, Cameroon, Brazil, Indonesia, and Malaysia. SWOT table was prepared to compare the strengths, weaknesses, opportunities and threats of these countries.

To study the contribution of area, yield and its interaction towards the increase in production, a decomposition technique has been used (Bastine and Palanisami, 1994). The algebraic model is described below.

$$P = Y_0 (A_n - A_0) + A_0 (Y_{n-} - Y_0) + (A_n - A_0) (Y_{n-} - Y_0)$$ Where,

P is change in production, A_0 is area in base year, A_n is area in current year, Y_0 is yield in base year and Y_n is yield in current year. Here on right side of the equation, first term is area effect, second term is yield effect and last term is interaction effect of area and yield.

The time series data on prices has been analyzed using the additive decomposition model :

$$P_t = T + C + I$$

Where P_t is observation on price for period t. T is trend component, C is cyclical component and I is irregular component.

The improved version of the Nerlovian lagged adjustment model has been used for supply response analysis of cocoa in India. The simplest form of acreage response model is $A_t = a + bA_{t-1} + bP_{t-1} + vt$ (Ranjit Kumar and Singh 2001). The above framework of the model does not change by including more independent variables in the model,

$$\ln A_t = bo + b1 \ln A_{t-1} + b2 \ln YA_{t-1} + b3 \ln Pc_{t-5} + b4 \ln YR + b5 \ln PR + b6 \ln PA_{t-1} + v,$$

where, A_t is acreage under cocoa in current period, A_{t-1} is one year lagged cocoa acreage. YA_{t-1} is one year lagged arecanut yield, Pc_{t-5} is weighed average of cocoa price for previous five years, YR is Yield risk of cocoa crop measured by the standard deviation of three preceding years' yield, PR is Price risk of cocoa measured by the standard deviation of three preceding years' market prices of wet beans and PA_{t-1} is one year lagged arecanut prices.

Based on the step down regression procedure, the non-significant variables were eliminated from the model to arrive at the final regression model.

$$\ln A_t = b_0 + b_1 \ln A_{t-1} + b_2 \ln P_{t-5} + b_3 \ln PR + v$$

Where, A_t is acreage under cocoa in current period, A_{t-1} is one year lagged cocoa acreage P_{t-5} is weighed average of cocoa prices for five preceding years and PR is price risk of cocoa crop measured by the standard deviation of 3 preceding years yield. The log linear form of acreage response function was chosen because it provides direct estimates of supply elasticities. The ordinary least square method was used for estimating the regression coefficients of the selected variables in acreage response function.

Results and Discussion

a) Global production scenario

Figure 1 illustrates the percentage break-up of cocoa production among producing countries. The production scenario in detail is studied based on seven major cocoa growing countries in the world. The cocoa production trends in the major producing countries are depicted in Figures 2, 3 and 4.

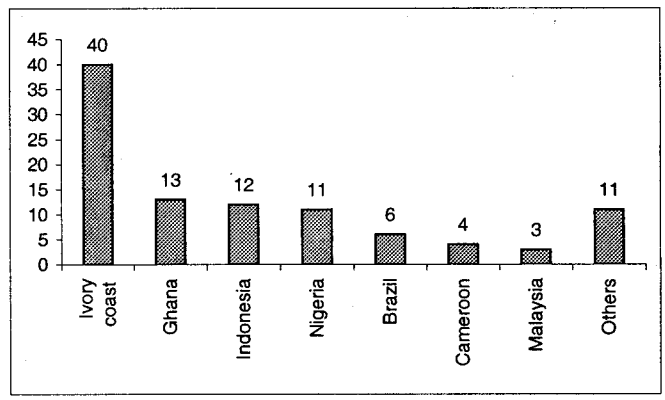

Fig. 1. Break up of cocoa production (%) among major producing countries (Year 2003)

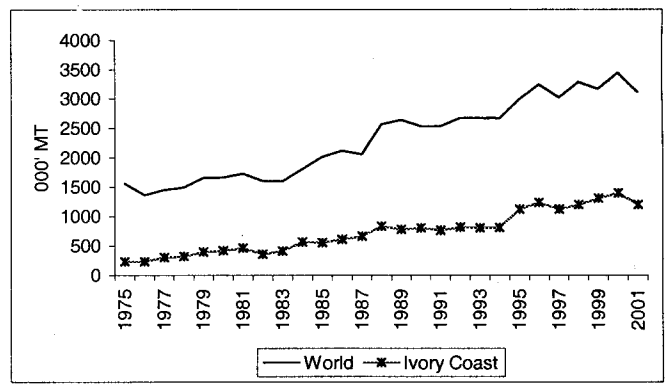

Fig. 2. Cocoa production trends in world and Ivory Coast

Table 1. CGR of production and decomposition analysis

Country	Period	CGR (Production)	Area Effect	Yield Effect	Interaction Effect
Ivory Coast	1975-2001	1.72	81	4	15
Ghana	1975-1984	- 8.65	74	46	- 20
	1985-2001	4.87	45	37	18
Nigeria	1975-1987	- 2.20	0	100	0
	1988-2001	1.86	113	- 10	- 3
Cameroon	1975-2001	0.56	29	67	4
Brazil	1975-1988	3.60	146	- 31	- 15
	1989-2001	- 4.83	- 4	102	2
Indonesia	1975-1987	22.37	62	5	33
	1988-2001	12.02	71	9	20
Malaysia	1975-1989	21.79	81	2	17
	1990-2001	- 10.48	97	7	- 14
World	1975-2001	3.63	65	21	14

Ivory Coast is the largest cocoa producer with a share of world production that grew from 23% in 1975 to 40% in 2001. Compound growth rate (CGR) of production from 1975 to 2001 was found to be 1.72%. The increase in production during the period was 0.97 million tons with 81% area effect (Table 1). Access to new forest land and increased yields from hybrid varieties cultivated in 1970s aided the production expansion. Farm gate prices declined in the late 1980s and early 1990s. Subsequently, investment into new plantings and production declined in the early 1990s (LMC, 2001) The Production Profitability of the country is very high because of cheap land and labour costs combined with average yield at 500kg/ha.

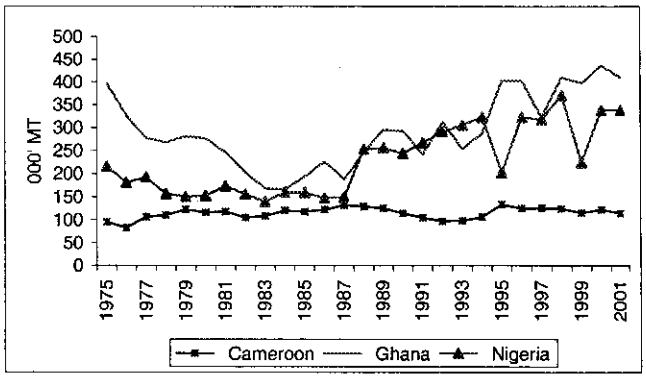

Fig. 3. Cocoa production trends in West Africa

Ghana is world's second largest producer of cocoa beans accounting for 13% of global output. Ghana was world's largest producer until the mid 1970s. Production declined sharply in next 10 years with CGR (-8.65) due to over taxation and economic policy distortions (Surendra and Brian, 2002). Production fell to an all time low of 159,000 mt in 1984. Policy reforms during 1986 instilled some confidence in the farmers, leading to recovery in production. Thus, the CGR of production rose to 4.87% for the period 1985-2001 (Table-1). There was an increase of 0.22 million tons of production with 47% area effect and 35% yield effect.

Nigerian cocoa production declined rapidly from a peak of 256,000 tons in 1975 to just 140,000 tons in 1986 (Figure 3). This was due to labour shortage and low producer prices in the country. Since liberalization in 1986, grower Prices increased significantly and production responded resulting 323,000 tons in 1993 (Abang and Ndifond, 2002). The CGR of production from 1988-2001 was 1.86%. There was an increase of 0.09

Table 2. SWOT analysis of West African countries

Country	Strengths & Opportunities	Weaknesses & Threats
IvoryCoast	• Production profitability • Low incidence of pests and diseases • Possibility of higher proportion of the export price in the liberalized environment (At present the share is about 52%).	• Illiteracy among the cocoa farmers. • The scarce land resources for further area expansion
Ghana	• Produces world's best quality bulk cocoa • Quality, consistency and performance reliability in the international export market	• The old cocoa plantations with low yield levels and high disease susceptibility. • The farmer's share of the export is one of the lowest in the world (48%) • Considerable losses arising from pests and diseases
Nigeria	• High share of export price because of the fully liberalized marketing system and the minimum taxes placed on the sector.	• Old cocoa plantation (60% of trees are more than 30 years old) and Incidence of pests and diseases • Shortage of rural labour
Cameroon	• Enough land reserves and low cost production systems. • Free market environments where farmer obtain 71-75 % of export prices. • Comparative advantage in producing highly flavored cocoa beans.	• Average yield level is low (300 kg/ha) as a result of high incidence of pests and diseases and a very old tree stock. • Reduced contract reliability in forward markets.

million tons of production during the period with 113% area effect (Table 1).

Cocoa production in Cameroon was fairly stable, falling below 100,000 tons only twice since 1975, while never rising above 133,000 tons (Figure 3). The CGR of production from 1975-2001 found to be 0.56%. The increase in production was 0.27 million tons during the period with 29% area effect and 67% yield effect (Table 1). Cameroon still has enough land reserves and low-cost production system and free market environments, where farmers obtain 71-75% of export prices.

From 1975 to1988 there was an increase in 0.09 million tons of production in Brazil with 146% area effect. Witches broom appeared in the late 1980s and has spread rapidly to the extent that it is now present in 99% of the Brazil's cocoa growing area (ICCO, 2002). Production declined from 392,000 tons in 1989 to 187,000 tons in 2001 with negative yield effect (102%). The CGR during the period became – 4.83 (Table 1). An efficient marketing system is present in the country where farmer receives about 80% of export price. The control of witches broom is labour intensive and the labour cost in Brazil is significantly high. This places cocoa sector at a competitive disadvantage.

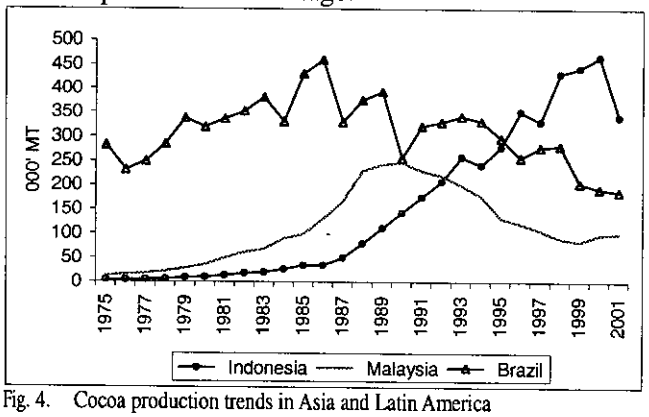

Fig. 4. Cocoa production trends in Asia and Latin America

Indonesian cocoa output increased at a phenomenal 22% CGR with 62% area effect from 1975-1987 (Table 1). The majority of the increase was from small holders producing at very low cost. The CGR declined to 12% during 1988-2001. Low production costs, highly competitive marketing system (90% share of FOB prices), excellent yield at 1000 kg/ha, favourable macro-economic policies and small holders entrepreneurship are all the positive aspects of Indonesian cocoa sector.

Malaysia experienced a rapid expansion in area and production from mid- 1970s to early 1990s with 21.8% CGR of production. The increase in production during the period was 0.2 million tons with 81% area effect (Table 1). Cocoa production declined from 247,000 tons in 1990s to 90187 tons in 1998. This was due to relatively low cocoa prices in the early 1990s compounded by the problem of labour shortage and the availability of more profitable alternative crops like oil palm (Kao, 1996). High yielding plantations (739 kg/ha) and efficient marketing system (85% share of FOB prices) are the positive aspects.

Tables 2 and 3 illustrate the SWOT analysis of major cocoa producing countries.

b) Global cocoa consumption scenario

Global cocoa demand is very much dependent on the demand of chocolates. Per capita income is an important determinant. Modern advertisement techniques and wider choice of chocolate products played a significant role in increasing cocoa consumption. USA is the world's largest cocoa-consuming country followed by Germany, UK, France, Russian Federation and Japan (Figure 5). Consumption of cocoa in Brazil has witnessed remarkable growth in recent times and it is now the seventh largest cocoa consumer in the world (ED & F Man. 2002).

Table 3. SWOT analysis of Asian and Latin American Countries

Brazil	• An efficient marketing system where farmer receives about 80% of export price.	• Witches broom infestation • Competitive disadvantage due to high labour costs. • Turbulent macro economic scenario
Indonesia	• Low production costs and excellent yield at 1000 kg/ha • Competitive marketing system where farm receives about 90% of export price • Favorable macro economic policies and small holders entrepreneurship. • Young cocoa gardens with plentiful supply of labour • Land reserves	• Dominated by small holders so cannot exploit the economies of size in long run • Cocoa pod borer affects production in several key-growing areas of Indonesia.
Malaysia	• High yielding plantations (739 kg/ha) • Efficient marketing system where farmer receives 85-90% share of export prices • Excellent export quality.	• Scarce labour capital with high labour cost • Reduced incentives for large cocoa Plantations.

Table 4. Region wise per capita consumption of cocoa

Country	Consumption (Kg)
Western Europe	2.78
North America	2.43
Oceania	2.07
Eastern Europe	0.72
Latin America	0.61
Africa	0.14
Asia	0.07
World	0.53

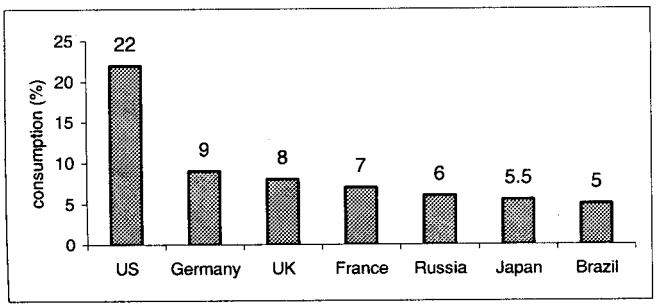

Fig. 5. Cocoa consumption (%) in major consuming countries

Chocolate consumption in a given country can be considered to be a function of income, climate and culture. Table 4 illustrates the region wise per capita cocoa consumption. Per capita consumption levels are highest in Western Europe and Northern America (Table 4). There is an increasing concentration of ownership of the world's cocoa processing industry in cocoa importing countries. There are now just four large independent cocoa processing and five major chocolate manufacturing companies, which account for 70% of global processing capacity. This will allow them to exploit the economies of scale, but at the same time gives considerable influencing power in terms of supply and demand of cocoa beans and products.

For the comparative study, cocoa consuming regions are divided into three groups, which are near saturated markets, emerging markets and high potential markets. Table 5 depicts the SWOT analysis of these markets

The markets of Western Europe and Northern America are classified into near saturated markets. They are traditional chocolate eaters and remain the drivers of cocoa consumption with very high per capita consumption. Although volume growth is difficult to achieve in traditional markets, there are opportunities for value growth by introducing premium products like low fat chocolates (Dand, 1999). A shift in consumption pattern from chocolates with high cocoa content to filled chocolate products (the cocoa content in such products is only 10-15 %), market stagnation and increasing health consciousness among consumers are areas of concern.

Central/Eastern Europe and Latin American markets are classified as emerging markets. Liberalized environment in Central and Eastern Europe since 1990s attracted heavy investment of confectionery manufacturers. Vast potential in Russia, excellent growth rate of consumption in Brazil, favourable climatic factors and scope for more innovative range of products are the positive aspects. Uncertainty in macroeconomic conditions and frequent economic crisis are the constraints.

China and India together can be called as high potential markets. The two countries together have a population of 2.5 billion. Excellent economic growth rates and a growing middle and upper class income may lead to higher cocoa demand. Fast track economic liberalization in these countries attracting a number of multinational firms. Although the population is large only a niche segment has the sufficient level of income to afford cocoa products (in China it is estimated at 180 million people and in India it is 80 million) (LMC, 2002). To some extent cultural and tropical climate may limit the growth of the chocolate demand. Any significant and sustained increase in the prices of cocoa can lead to a different consumption pattern resulting in negative effect on future demand.

Table 5. SWOT analysis of cocoa consuming markets

Market	Strengths & Opportunities	Weaknesses & Threats
Near-Saturated	• Traditional coco consumers • Very high per capita consumption • Scope of value growth (Low fat/premium)	• Shift to chocolates with low cocoa content • Increasing health consciousness
Emerging	• Liberalized market. • Heavy investment by confectionery firms • Climatic factors • Excellent growth rate of consumption in Brazil • Vast potential of Russia	• Small population size • Uncertain macro economy • Frequent economic crisis
High- potential	• Population size • Economic growth rate • Liberalized economy	• Affordability • Culture & Climate

c) Time series analysis of international cocoa prices

Figure 6 illustrates the general price movement of cocoa over the years. The trend, cyclical and irregular components of time series data of cocoa prices from 1961 to 2001 are depicted in Figure 7. A distinctive cyclical pattern can be observed. The irregular component was dominant in mid 70s and early 80s.

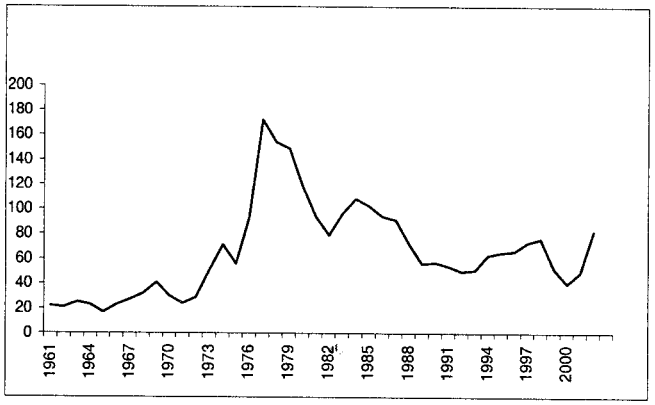

Fig. 6. Cocoa price movement over the years (Us cents/lb)

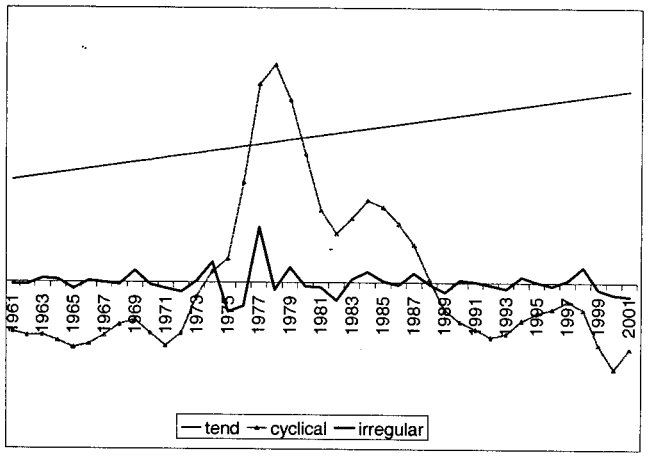

Fig. 7. Time series components of cocoa prices

World cocoa market is one of the most volatile markets exhibiting cyclical fluctuations in prices resulting from changes in stock level. Historically cocoa supplies have shown considerable variations; in contrast, cocoa consumption is relatively inelastic. Over the past 30 years, cocoa market has gone through a number of cyclical phases of periods with very high prices and with very low prices. Tight supplies and high prices characterized the 1970s. Cocoa production averaged at 1.5 million tons and prices were at historically high level averaging almost US cents 180/lb. Higher prices combined with government policies aimed at expansion of cocoa cultivation resulted in a period of sustained increase in cocoa production in the 1980s. A period of structural surpluses resulted in a steady build up of world cocoa bean stocks to a record high of over 1.5 million tons, equivalent to almost 8 months of global demand. As a consequence, cocoa prices dropped drastically falling to an all-time low in the early 1990s. The 1990s dominated by supply deficits, but prices have not reacted much to these deficits because of high stock levels (around 1.2 million tons). In 1999, cocoa prices fell to the lowest level of the decade (Figure 6). Market fundamentals fail to explain the cause of price crash. Studies reveal that speculation by major trading firms do correlate with the fall in prices. However, the prices recovered in 2001 showing an upward trend.

d) Cocoa production scenario in india

India produces just 0.32% of global cocoa production (Table 6). The state wise area, production and yield of cocoa in India are shown in Table 7. Trend in area and production was analyzed (Table 8). The entire study period was divided into 3 intervals based on increasing and decreasing trends in area and production. The commercial cultivation of cocoa started in India in 1970s and the area under cocoa reached 29,000 hectares by 1980-81, mainly due to the attractive prices during that period (Velappan, 1995). This trend of area expansion did not continue further because of the subsequent steep fall in price and the area under cocoa started declining year after year till 1996 with compound growth rate of –5.90 during 1981-1994. Thereafter cocoa acreage showed an increasing trend due to the reasonable and consistent prices providing for cocoa beans. Notwithstanding the decline in area, there was a gradual increase in production because whatever area remained was attaining full bearing stage. From 1997-98 onwards, the non-traditional tracts of Karnataka and other states like Andhra Pradesh and Tamil Nadu started developing cocoa.

Table 6. Comparison of Indian cocoa production with world (Year 2004)

Item	World	India
Area (Ha)	6897113	17800
Production (MT)	3183166	10200
Productivity (Kg/ Ha)	461	560
Per Capita Consumption (Kg)	0.53	0.08

Table 7. State wise area, production and yield of cocoa in India (Year 2004)

State	Area (Hectares)	Production (MT)	Yield (Kg/Ha)
Kerala	8700	6500	747
Karnataka	6000	2500	416
Andhra Pradesh	2700	1000	370
Tamil Nadu	400	200	500
Total	**17800**	**10200**	**560**

The estimated acreage response function revealed that weighted average of lagged cocoa prices, lagged cocoa area and standard deviation of cocoa prices had a significant impact on area allocation. Lagged cocoa area

had a positive and significant impact with 0.62 elasticity, lagged cocoa prices had a positive and significant impact with elasticity 0.38, Standard deviation of cocoa prices found significant with elasticity coefficient -.042. (Table 9).

Table 8. Compound growth rates of area and production in India

Area		Production	
Period	CGR (%)	Period	CGR (%)
1976-80	43.50	1976-85	55.70
1981-94	-5.90	1986-96	-2.65
1995-02	5.68	1997-02	10.08
1976-02	-0.95	1976-02	11.56

Table 9. Supply response analysis of cocoa in India

Variable	Description	Elasticity	R^2	
A_{t-1}	Lagged cocoa area	0.62	0.88	
P_{t-5}	Lagged cocoa prices	0.38	0.86	
PR	Standard deviation of cocoa prices		-0.04	0.83

e) Cocoa consumption scenario in india

The cocoa industry in the country had expanded to a considerable extent in recent years. The competition in the confectionery industry has increased. The industry has the capacity to process 30,000 tonnes of cocoa beans against the current domestic availability of 10,000 tonnes. The market growth in the chocolate segment is15%. The market has 80 million consumers and they are mainly located in the urban area (Agarwal, 1999). In India, cocoa demand is more a function of affordability. Chocolate consumption in the country is extremely low. Per capita consumption is around 160 grams in urban areas compared to 8-10 kg in developed countries. In rural areas it is even lower. Chocolates in India are consumed as indulgence and not as a snack food. There is large untapped demand in urban markets alone. Only 60 million people out of the urban middle class population of 280 million consume chocolates. A trend of increasing consumption of chocolates and other cocoa-based products has emerged in the country especially among the middle class. Studies have revealed that demand for and consumption of such food is more income elastic than price elastic.

Summary and Conclusions

From 1975 to 2001, world cocoa production grew at a compound growth rate of 3.63%, where 65% area effect and 21% yield effect were observed in the change in production. Despite the large number of producing countries, production is highly concentrated. This leaves global production extremely vulnerable to potential supply problems. The liberalization policies in West African countries are achieving the aims of higher export value share for the farm gate prices. However, liberalization has made small holders more vulnerable to price volatility. Per capita cocoa consumption levels are highest in Western Europe and Northern America. USA is the world's largest cocoa consuming country followed by Germany and UK. China and India are high potential consumption centers for the huge population and excellent economic growth rates in these countries. A distinctive cyclical pattern is observed in the time series analysis of cocoa prices. It is advisable to save and reinvest the extra income from sharp price rises to promote future productivity and value addition according to the market requirement. Kerala and Karnataka are the major cocoa producers in India. From 1997 onwards, Andhra Pradesh and Tamil Nadu started developing cocoa. The estimated acreage response function revealed that weighted average of lagged cocoa prices, lagged cocoa area and standard deviation of cocoa prices had significant impact on area allocation. The cocoa industry in India has a demand gap of around 20,000 tonnes. The market growth in chocolate segment in India is impressive at 15%, but it does not mean that whatever we produce in the country will find a market. The chocolate firms have their procurement strategy, which will look for price advantages. In a liberalized environment, the international prices will directly reflect on the domestic prices. Moreover, India is a minor player in cocoa and doesn't hold any bargaining power in the international market. The success of cocoa in any country lies in low cost of production, comparative advantage of cocoa over competing crops and the relative success in limiting the incidence of pests and diseases.

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