

Farmers' Perspectives on Impact of Climate Change on Cocoa Cultivation and Production in Pollachi Region of Tamil Nadu, India

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ABSTRACT

To analyze the present situation of cocoa plantations over Pollachi, Tamil Nadu, India and perception of farmers about the impact of climate change on cocoa cultivation, a survey-based analysis was carried out. Data were collected from randomly selected farmers in Pollachi region. The climate of the study area favors the growth of cocoa. Cocoa is intercropped in the coconut plantations and the age of cocoa plantations are an average of eighteen years old. Most of the cocoa farmers (95%) belong to large farmer category and average land holdings ranged from 9 to 80 acres. Out of this cocoa occupies 1 to 50 acres with an average of 15 acres. Farmers were acknowledged that there is a change in the climate over the years in terms of rainfall intensity and quantity and the change is unfavorable to cocoa cultivation. Increased frequency of drought was also noticed by the farmers.

Key words : Cocoa; Climate change; Farmers' perception.

In India, cocoa (*Theobroma cacao* L.) cultivation on commercial scale was successful in south India covering Kerala, Tamil Nadu, Andhra Pradesh and Karnataka. In Tamil Nadu, Pollachi taluk of Coimbatore district covers the major portion of cocoa grown due to its climatic suitability.

Cocoa is mainly used for production of chocolates, health drinks, cosmetics and pharmaceutical industries and is globally consumed. Indian demand for cocoa is increasing at a healthy rate of 8 per cent per annum. The Indian chocolate market is believed to be worth around Rs 15 billion and offers great potential for western chocolate manufacturers as the market is still in its early stages. India imported 19000 tonnes of cocoa products, which include beans, paste butter and chocolate preparations, in 2007-08 fiscal year. The total value of imports come to Rs. 189 crore and in 2008-09 the total value of imports was estimated to be around Rs. 184.5 crore. Cocoa is highly susceptible to drought and the pattern of cropping of cocoa is related to rainfall distribution (Ali, 1969). Cocoa can only be profitably grown under temperatures varying between 30-32°C mean maximum and 18-21°C mean minimum and absolute minimum of 10°C (Wood and Lass, 1985). Black pod disease is the most destructive of a number of diseases, which attack the developing or ripening cocoa pod. The disease is closely related to weather and climate. It is more prevalent in damp situations and is most destructive in years when the short dry period from July to August is very wet. Mirids are sucking insects that make cocoa difficult to establish. On mature cocoa, capsid damage can cause tree death. The insects are usually most active and destructive from September to March particularly when moisture deficit is severe. They are favored by high light intensity and humidity in the cocoa micro-environment (Brew, 1991).

It prefers 50 - 60 per cent shade and is normally raised as an inter crop in coconut and areca nut plantations. India has around 75, 000 acres of cocoa farmland with a production of 9000 to 10,000 metric tonnes. Tamil Nadu government's efforts in promoting cocoa as an inter crop in coconut to increase the income of farmers. According to experts, five hundred cocoa plants can be planted in one hectare as inter crop in coconut with improved varieties come to yield in three years. The farmers can get an additional income of about Rs. 40, 000 from one hectare of cocoa plantation by inter cropping in coconut /arecanut plantations. Changing climate can also alter the development of pests and diseases and modify the host's resistance. Extended drought will cause the newly transplanted young cocoa plants and some cocoa trees to wither, while major pests and diseases of cocoa are promoted by unfavorable climatic situations. More importantly, the black pod disease is a major threat to cocoa production when the relative humidity is very high (Anim-Kwapong and Frimpong 2005). Focus of the cocoa crop expansion programme will be Andhra Pradesh, Tamil Nadu and Karnataka, with the directorate spending Rs 77 crore under the 11th Plan. Andhra Pradesh, Tamil Nadu and Karnataka together, have around 300000 hectares of irrigated coconut plantations, which can be exploited to provide additional income to farmers (Directorate of Cashew and Cocoa Development (DACCD).

In recent years due to climate change every crop gets affected and the climate sensitive cocoa is no exception. Cocoa crop is now gaining attention in terms of internal domestic usage and hence more insight will be needed to analyze the impact of climate change on cocoa production. An attempt was therefore made to know about the perception of farmers about the climate change impact on cocoa cultivation in Tamil Nadu.

METHODOLOGY

The present study was carried out on the cocoa-growing farmers of Pollachi region of Coimbatore district in Tamil Nadu during the period between June and August 2012 (Figure 1). It lies in the latitude of 10°39' N and longitude of 77° 03' E. Average annual rainfall is 121.22 cm and average annual rainy days is 44.5. Summer mean maximum temperature is 34.7°C and mean minimum temperature is 22.1° C. Likewise winter mean maximum temperature is 32.2°C and mean minimum temperature is 9.2° C. Owing to the proximity to the Western Ghats, Pollachi has a pleasant climate throughout the year. Pollachi is a major producer of vegetables especially tomato and coconuts as well as related products in the region. Pollachi accommodates one of the largest coffee producers viz. Thalana Agro situated near Valparai. Now cocoa is cultivated as intercrop in the coconut plantation for the past 20 years.

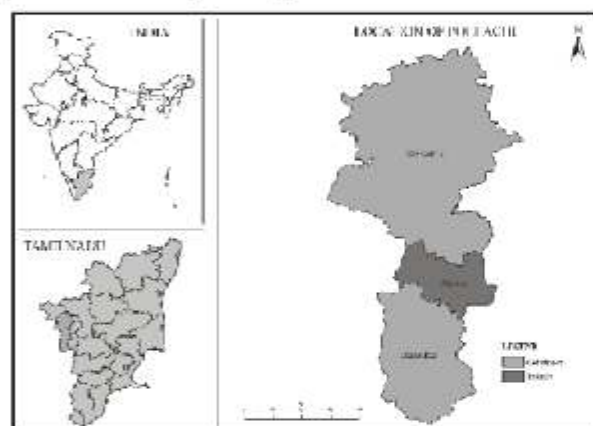


Figure 1: Location map of the study area

Collection of data and data analysis : The study was based on collection of primary and secondary data from cocoa growing farmers of Pollachi region of Coimbatore district in Tamil Nadu. A questionnaire was developed to study the perception of cocoa farmers on cocoa production and impact of climate change on cocoa. The questionnaire was pre- tested with few farmers to improve the quality and clarity of the objective. The final questionnaire is structured in such a way that the interviewees had wide scope in expressing their views and concern. Primary data were collected by personal interviews and the data

were validated with the elite farmers and horticulture officers of the study area. This was done to ascertain the vulnerability of farmers to prevailing negative conditions and strategies adopted to ensure livelihoods. All the collected information was summarized and scrutinized carefully and recorded. They were analyzed using Ms Excel based on the objectives of the study.

RESULTS AND DISCUSSION

Factors influencing cocoa area : Land holding of the farmer and area under coconut determines the area of cocoa. As cocoa is shade-loving crop it is grown as intercrop in coconut gardens. In cocoa pockets of Pollachi area almost 95% of the farmers belong to large farmer category (> 10 acre) with 4% of medium farmers (< 10 acre). There were no small or marginal farmers. Average land holdings was 35 acres. Land holdings ranged from 9 to 80 acres. Out of this coconut occupied an area of 8 to 75 acres with an average of 30 acres. In that cocoa occupies 1 to 50 acres with an average of 15 acres. Percentage of coconut area to the land holdings is 86 per cent (Average) and that of cocoa is 49 per cent (Average) invariably F₁ Hybrid (Forastero) was the choice of farmers. Cent per cent of plantations in Pollachi are Forastero. Age of cocoa ranged from newly planted saplings to 18-year-old tree. Planting density of cocoa varied from 100 to 300 trees/acre with an average of 178 trees / acre. Majority the population density and spacing of cocoa is based on coconut spacing adopted (Table 1)

Limiting factors : Cocoa is highly sensitive to changes in climate from sunshine hours, rainfall intensity, irrigation, soil conditions and particularly to temperature due to effects on evapotranspiration. Climate change could also alter stages and rates of development of cocoa pests and pathogens, modify host resistance and result in changes in the physiology of host-pathogen/pests interaction. The most likely consequences are shifts in the geographical distribution of host and pathogen/pests, altered crop yields and crop losses which, will impact socio-economic variables such as farm income, livelihood and farm-level decision making.

Table 1
Land holdings, per cent area to coconut and cocoa.

Statistics	Land owned (Acre)	Coconut area (Acre)	Per cent area land owned: coconut	Cocoa area (Acre)	Per cent area cocoa: land owned	Population density
Minimum	9.0	8.0	26.7	1.0	2.0	100
Maximum	80.0	75.0	100.0	50.0	100.0	300
Average	34.2	29.5	86.2	15.3	49.5	178.1

Irrigation, pest and marketing are the issues that bother the cocoa growers. Open well and canals are the major irrigation source. Type of irrigation varied from garden to garden. Flooding, basin and drip were the type of irrigation followed. Predominantly flooding and drip irrigation was practiced. Frequency of irrigation ranged from 4 days to one month. The frequency of irrigation is based on age of coconut and cocoa and mainly the season. On an average 15 days once the farmers irrigate their fields.

In the area surveyed, most of the soils are red sandy loam (~ 95%). Few places have clay soil. At some places Zn deficiency was noticed. Intercultural operations like pruning and weeding are more common for cocoa. Major insect pest found in that area is mealy bugs, red ant, skeletonizer and tea bug. Major disease infestation is black pod and canker. Rodent damage causes major yield loss at harvesting stage.

Area expansion : Even though the farmers are willing to expand area under cocoa the rodent problem, labor availability and marketing issues bothers them. Government distributed cocoa saplings were the source for all the farms. Cadburys, Campco was the major buyers and Cadburys is the only regular buyer of that area. No gender issues and no farmers have insured the crop.

Perception on climate change : Perception about cocoa farming has entirely changed in the past few years. Cocoa is now being promoted as inter-crop unlike earlier when it was sold as a mono-crop. This reduces risk for farmers even in times of falling prices. Low productivity of cocoa also adds to the advantage of using it as an inter-crop. Farmers of age above fifty years were the respondents for the climate change part of the survey. Almost all the farmers acknowledge that there is a change in the climate over the years and the change is unfavorable. Rainfall amount was decreased and the distribution is uneven. Frequency of drought increased and the rainfall is becoming more intense with less rain days.

They indicated that rainfall pattern over the past ten years have been unstable and that a year with good rainfall was accompanied by good growth and yield of cocoa. They also indicated that excessive rainfall was accompanied by high incidence of black pod disease and yield losses just as drought conditions also gave rise to poor yields and high seedling mortality. Similar results were obtained from the studies of Animkwapong and Frimpong (2000). Majority of the farmers (96%) interviewed perceived climate change in terms of changes in rainfall pattern. They indicated that rainfall pattern over the past ten years have been unstable and that a year with good rainfall was accompanied by good growth and yield of cocoa. They also indicated that excessive rainfall was accompanied by high incidence of black pod disease

and yield losses just as drought conditions also gave rise to poor yields and high seedling mortality.

Table 2.

General perception of farmers about the impact of climate change

Sr. No.	Parameters	Increased (%)	Decreased (%)	No change/ No idea (%)
1	Temperature	100	0	0
2	Frequency of drought	91	0	9
3	Rainfall quantity	0	98	2
4	Rainfall intensity	94	0	6
5	Timing of rainfall		Untimely-100	

In the current study people gave different opinion about the changes of weather variables. Cent per cent of the people say changes can be seen in rainfall, 91 per cent opined that frequency of drought is increased, 94 per cent of the respondents perceive that rainfall intensity is increased and 98 per cent attributed to decreased rainfall quantity (Table 2) Similar results were obtained from the study of Tunde (2011). 80 per cent says changes can be seen in rainfall, 73 per cent attributed it to temperature, 77 per cent opined that it is sunlight, while 50 per cent said it was relative humidity. This is in support of Essop (2009) that minor changes to rainfall pattern (especially coupled with increased severity of droughts and floods) threaten food security. This is attributed to the fact that people perceived climate change in different ways. This agrees with the findings of Actionaid (2009) that agriculture contributes to and suffers from negative effects of climate change.

CONCLUSION

Results show that observed climate changes are currently affecting cocoa production activities in different ways. Future increases in rainfall poses a lot of problem to cocoa production as elasticity with respect to rainfall was the highest. Rainfall amount was decreased and the distribution was uneven. Frequency of drought increased and the rainfall is becoming more intense with less rain days. The survey result of concentrated cocoa belt of Tamil Nadu reveals that cocoa is a promising additional source of income to the coconut farmers. The present scenario of market needs to be taken care to ensure good market price for the product. Better management practices are needed for rodent problem. Irrigation and other management practices should be standardized. The future impact of climate change has to be taken care to formulate proper adaptation measures.

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REFERENCES

1. Actionaid, 2009. Sustainable Agriculture and Climate Change. *An Actionaid Rough Guide*.
2. Ali, F. M. 1969. Effects of rainfall on yield of cocoa in Ghana. *Experimental Agriculture*, 5: 209-213.
3. Anim-kwapong, G. J., Frimpong, E. B. 2005. Vulnerability of agriculture to climate change- impact of climate change on cocoa production. Report for vulnerability and adaptation assessment under the Netherlands climate change studies assistance programme phase 2 (NCCSAP2), *Cocoa Research Institute of Ghana new tafo akim* : 44.
4. Brew, K. M. 1991. Relationship between yield, rainfall and total sunshine hours. *Rep. Cocoa Res. Inst. Ghana. 1988/89* : 30-32.
5. Essop, T. (2009), Climate change 'a great issue' *My News 24*.
6. Tunde, A. M. 2011. Perception of climate variability on agriculture and food security by Men and women farmers in Idanre L.G.A, Ondo State. Nigeria. *Ethiopian J. of Environmental Studies and Management*. 4 (2), :14
7. Wood, G. A. R and Lass, R. A. (1985). Cocoa (4thedn). *Longman Scientific and Technical* : 119-120.