Cacao Production in Cameroon: Technology, Profitability and the Environment[1]

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In the last two decades there has been increasing concern in developmental circles with environmental objectives. Unfortunately, there is often a tradeoff between profitability combined with long-run market potential and environment objectives. Cameroonian cacao production has been treated as an extractive industry with fertilization from forest litter and consequent low yields, about 326 kg/ha (Fig. 1), and low returns to farmers. Traditionally, spraying of insect and disease pests has been undertaken but with the low returns of recent year, this control has also been declining. An extensive production system has been justified for the benefits of diversification with other trees and plants in the ecosystem and for increased carbon sequestration. More shade also generally results in longer tree life and fertilization can be a high cost input for small farmers.

Alternative systems have been used in Cote d'Ivoire and Indonesia. In Cote d'Ivoire the system of reduced shade or no shade is rapidly depleting the soil due to the failure to fertilize. By rapidly cutting the rainforest and raising yields to 567 kg/ha, Cote d'Ivoire's market share has increased from 7% in 1961 to 24% in 2000 (total value of all production in dollars (FAO statistics). Unfortunately, rates of soil depletion associated with this system are rapid and Cote d'Ivoire is running out of rain forest. In Southeast Asia, Indonesian cocoa producers are obtaining 1.1 metric tons/ha by reducing the shade and by fertilizing and controlling pests better.

[1] A synthesis of the thesis of Harounan Kazianga, Adoption of Improved Cocoa Technologies in Cameroon, Purdue University, Department of Agricultural Economics, West Lafayette, IN, 2002; for USAID.

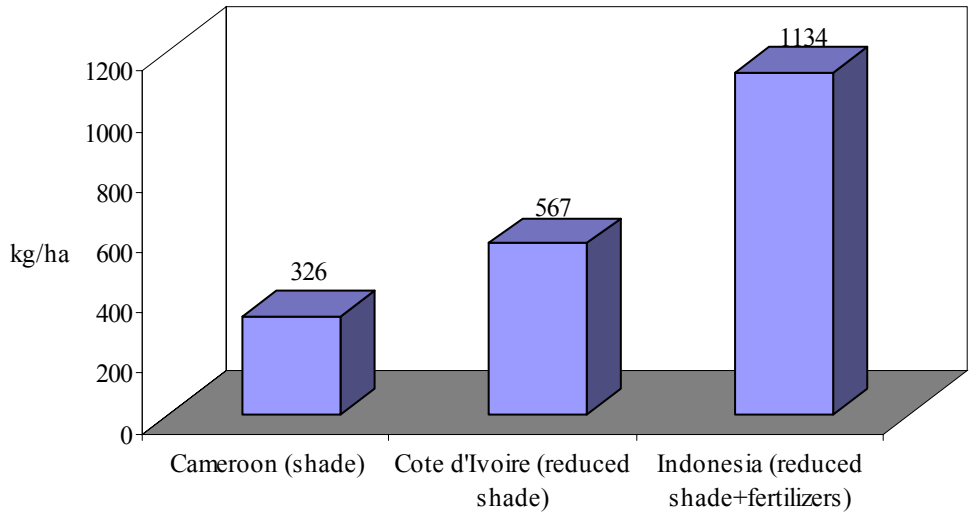


Figure 1. Yields (1998-2001) in Three Cocoa Production Systems

Source: FAO, 2002. From Harounan, 2002, p. 5.
Note: Pesticides are applied in all three systems

We look at the technology alternatives to Cameroonian farmers and indicate one policy mechanism to accelerate diffusion. We highlight the implications of new technologies (improved pest controls and a combined activity involving fertilization) for yields and farm incomes. We then discuss environmental objectives, policy changes, and long run market shares.

Technologies and Policies

With long-run falling real international prices in cacao, there has been a general stagnation in the sector in Cameroon (Fig. 2). One consequence of this diminished profitability is the decline in the use of pesticides. Control of both Black Pod disease and capsid bugs is well known to be essential for high-quality cacao and for increasing yields. Farmers know this. Previously the government had subsidized the costs of this control. With structural adjustment, the government stopped the input subsidies and farmers are no longer effectively controlling these pests. Based upon expert estimates of the degree of pest control, Figure 3 illustrates the potential yields of good pest control by village and tree age. Note that in the rainforest, pests are very serious leading to losses of 35 to 65%

(Kazianga, 2002, p. 19). It is not economically feasible to eliminate all of this damage but it becomes more profitable to eliminate damage as the yields increase with increased fertilization or new cultivars.

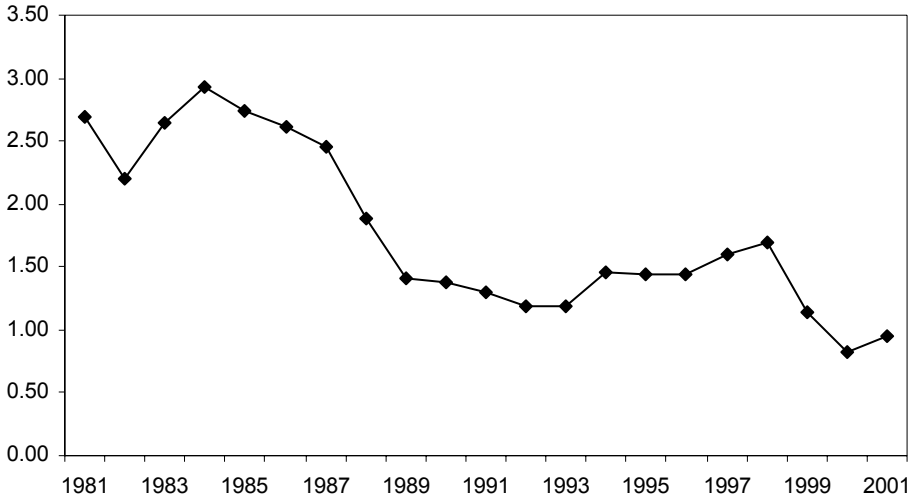


Figure 2. Cocoa International Real Price, US$ per kg (1981-2001)[2]

Source: ICCO, 2002. Taken from Harounan, 20002, p. 11.

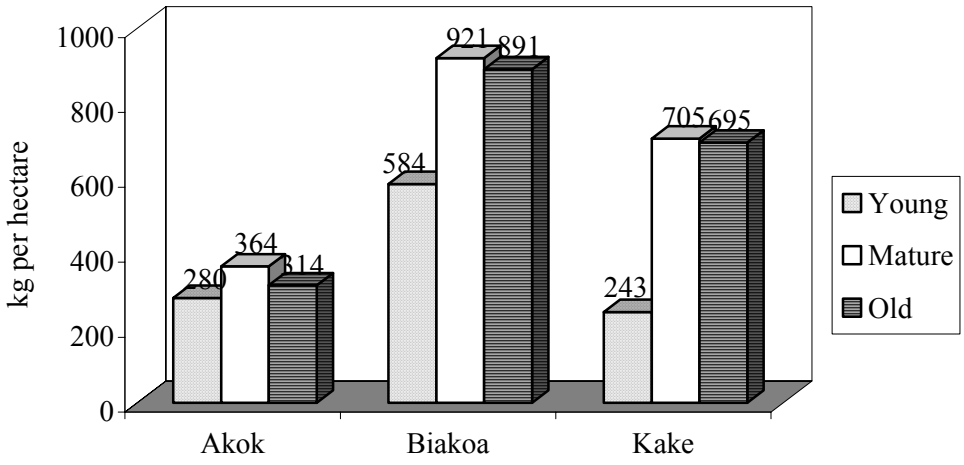


Figure 3: Estimated Potential Pest Free Yields per Village and Tree Age in Three Cameroonian Villages

[2] We use constant prices (base is 2001). Deflator uses the wholesale price index (manufacturing). Nominal prices are taken from the ICCO (online), and deflator from the IMF' International Financial Statistics Yearbook (1999 and 2001).

Source: Model results in Harounan, 2002, p. 59.
Note: For the level of soil fertility, age structure and variety these are the maximum pest free yields.

Using farm-level programming models, we evaluated the conditions under which farmers would return to better control of pests. We also investigated the potential income and yield impacts from reducing but not eliminating the amount of shade, moderate levels of inorganic fertilizer plus better pest control. Model results indicated that the prerequisite to either change was a moderately increased price received by farmers. There are many ways for prices to increase from 400 CFA/kg to 500 CFA/kg. Besides the international price recovery already underway in the last two years, there are a series of micro measures to achieve these moderate increases in prices. These include better quality control, selling through cooperatives, and others resulting from public investments such as better price information systems and improved transportation. This 25% increase in farm level prices is considered reasonable from any of a number of micro adjustments as well as the recovery and pass-through to farmers of an international price recovery.

With these slightly increased farm level prices, it becomes profitable for farmers to not only increase pesticide use but also to apply inorganic fertilizers.[3] With conservative estimates of the differences between experiment station and farmers' yields, farmers were still able to increase yields by 28 to 111% in the three villages with increased fertilization (plus reduced shade and increased pesticide, Fig. 4). We also found substantial income gains, plus the price recovery, in the three villages associated with the introduction of the technologies (Fig. 5).

From the perspective of an individual producer, the costs of the failure to use modern inputs are high. Are donors willing to compensate farmers for the low yields obtained under heavily shaded systems in order to produce more carbon sequestration or other social goals associated with rainforests?

[3] For this technology, it was assumed that farmers would only get one-third of experiment station yields. On the experiment station, there are generally better soils, better control of all factors, and improved timeliness. There is also a learning-by-doing effect by farmers. Since this two-thirds discount was considered to be very conservative and fertilization is not a difficult technology, a one-third adjustment would probably be more appropriate. So yields and profits would be even higher.

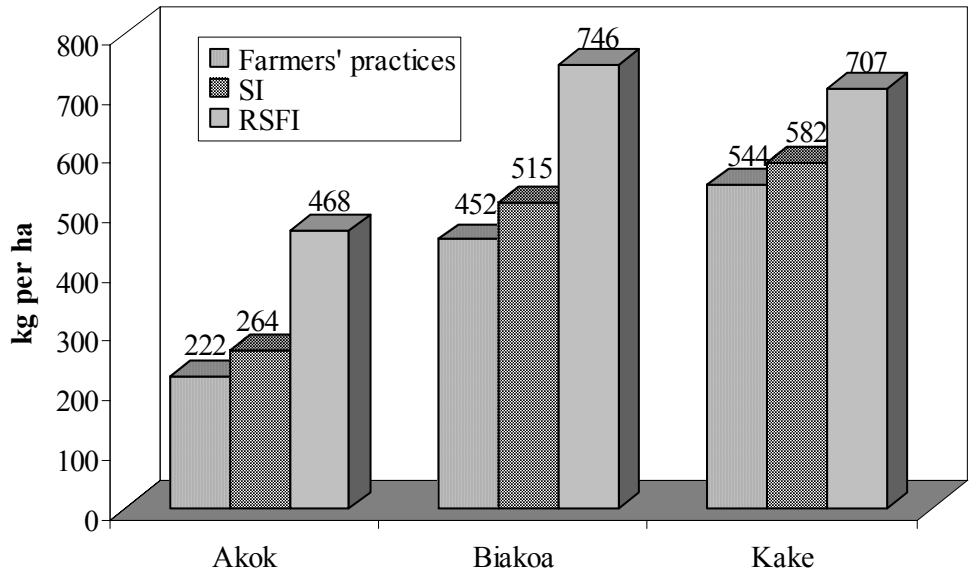


Figure 4. Yields from the different technologies in the three villages of Cameroon

Source: Model results from Harounan, 2002, p. 77
Note: SI is shade with improved pest control and RSFI is reduced shade/fertilization/improved pest control.

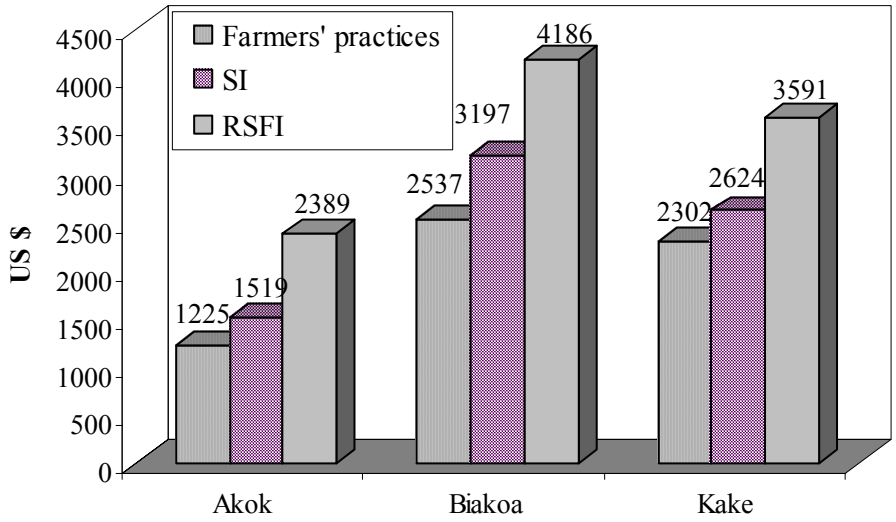


Figure 5. Farm incomes from the different technologies in the three villages of Cameroon

Source: Harounan, 2002, p. 77.
Note: SI is shade with improved pest control and RSFI is reduced shade/fertilization/improved pest control

Policy Implications

A number of associated techniques could raise farmers' incomes from the low level extractive industry that currently characterizes Cameroonian cacao production. The potential gains to private profitability also indicate a fairly high cost to donors to compensate farmers for not using more intensive systems.

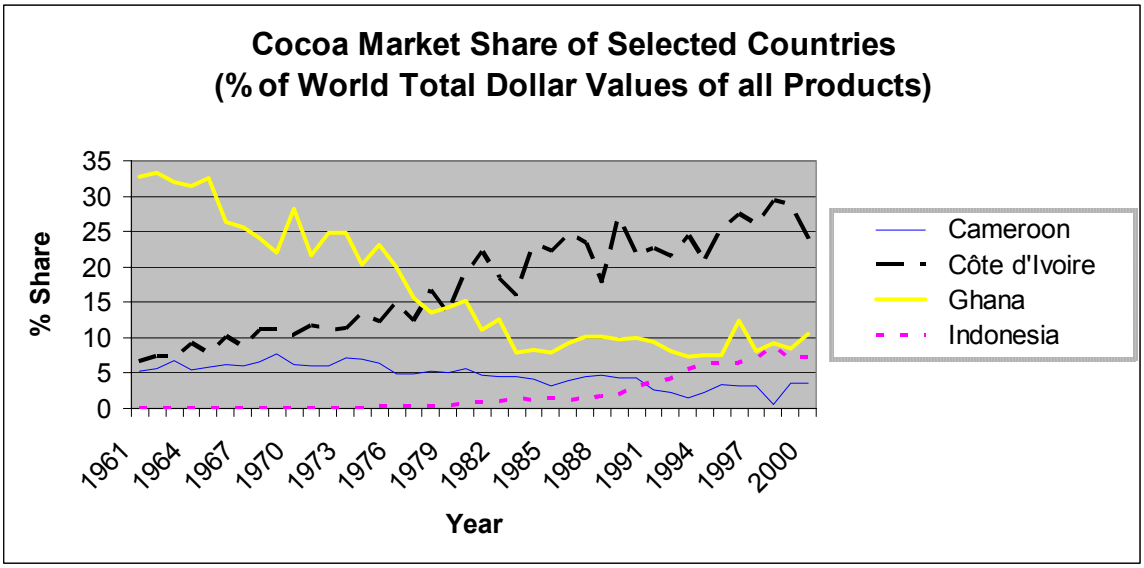
In the more intensive systems of Cameroon, production costs per output unit decrease. Assuming that Southeast Asia can attain similar cost savings per unit of output for the more intensive system, then Southeast Asia will continue to increase its market share over time. There is a historical precedent for this of the shift of the predominance in world markets of the extractive rubber industry in Brazil to intensive production in Malaysia. Cote d'Ivoire's continued high market share has been dependent upon rapid area expansion and continued soil depletion so it is not expected to be sustainable. Market share has been lost by both Ghana and Cameroon while Indonesia has made rapid gains (Fig. 6). There are also rumors in the industry that Vietnam will be encouraging farmers to expand cacao production there.

If small farmers in Cameroon and other West African countries[4] lose their market share to Southeast Asia, the welfare of many small farmers will be threatened. Moreover, substantial government revenue will be lost. Environmentally, the alternative of increased food crop production is potentially much more adverse to the remaining forests than is the production of a tree crops such as cacao. The sustainability of partially shaded trees is expected to be much higher than the cut-and-slash annual cropping that many small farmers will revert to if West Africa is no longer competitive in the world cocoa market.

(For further details, read the dissertation)

[4] West African smallholders produce about 70% of the global cocoa supply (FAO, 2002). In 1997-98, there were an estimated 2.4 million cocoa farmers in the four leading producing countries (Cote d'Ivoire, Ghana, Nigeria, and Cameroon), with an average cocoa holding per farmer ranging from one in Cameroon to two hectares in Cote d'Ivoire (Federation of Cocoa Commerce, 2000).

Figure 6


Cocoa Market Share of Selected Countries
(% of World Total Dollar Values of all Products)
% Share
35
30
25
20
15
10
5
0
1961
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
Year
Cameroon
Côte d'Ivoire
Ghana
Indonesia