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Drivers of cocoa production growth in Ghana

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Key points

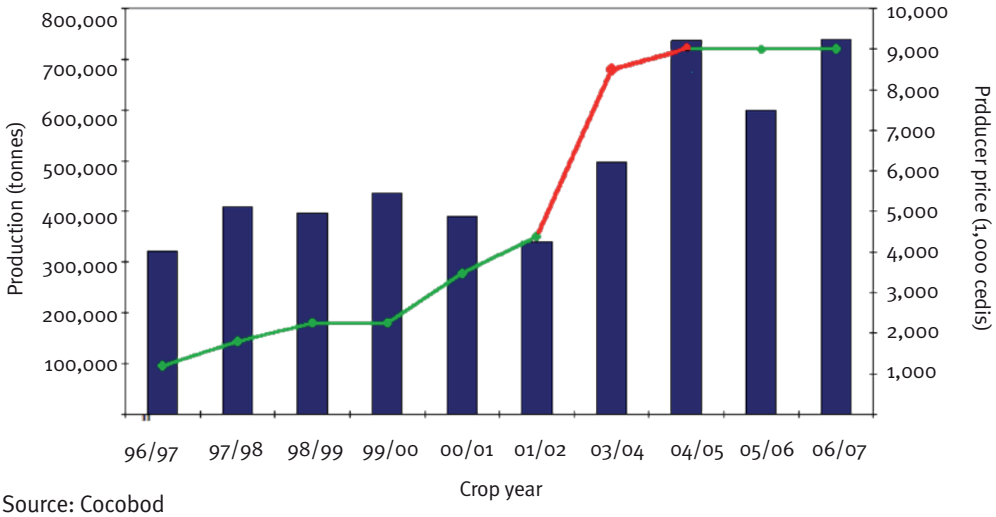
- A major cocoa production boom was observed in Ghana between 2001 and 2003. There is a general belief that this was primarily the result of a mass spraying programme, combined with a dramatic rise in fertiliser use.
- Factors outside farmers' production choices — good rainfall, and reverse smuggling (from the Ivory Coast) — have probably been played down in their contribution to the doubling of production.
- This episode of growth is unlikely to be easy to replicate without knock-on costs to the functioning and long-term sustainability of the sector.

Ghana is the second largest world supplier of cocoa after Cote d'Ivoire. Since 2001, the volume of cocoa produced in the country has grown at unprecedented rates (at a yearly average of 11% between 1994–99 and 16% in the following 2000–03 interval – see Figure 1). Many actors involved in the sector have attributed this production boom to the increase in fertiliser use and a government sponsored mass-spraying exercise beginning in 2001. Farmers are progressively integrating fertiliser use and spraying practices into their own cultivation of the cocoa crop. But the empirical evidence supporting this theory suggests additional sources of growth are also important. Cocoa is characterised by a much longer production cycle than other tropical crops: new hybrid varieties need at least five years to come into production, and 10-15 years for the tree stock to reach its full bearing potential.

Both high and low growth phases are generally seen in five-year periods. Ruf (Cirad), in his many accounts of cocoa cycles worldwide, suggests that dramatic growth results from a combination of extension into new forest land (with its severe repercussions on the long-run

Farmers from Ekutuase, Ashanti, who participated in Ghana Cocoa Farmers Survey, 2002

Fig 1: Cocoa production and (real) producer prices, 1996-2005



Source: Cocobod

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erosion of land fertility), and migration of cheap labour forces from neighbouring countries (for example, the Ivorian and Indonesian experiences), or across regions (as was observed in Ghana in the 1970s, when people from poorer northern regions migrated to thw southern cocoa belt in search for better livelihood opportunities).

There are important questions that need to be considered to understand Ghana's cocoa boom:

- Land productivity is generally taken as a measure of production efficiency — to what extent has the production increase been linked with a comparable increase in cocoa yields?
- Have factor proportions — such as the ratio of labour to land, or that of non-labour inputs to land — changed the efficiency of the technology of production? More specifically, have farmers cultivated their cocoa efficiently, independently of the size of the cocoa farm they managed?
- How effective has producer price been in providing market signals to improve the technology of production?
- Are boom episodes of similar magnitude replicable in such short time cycles and, if so, to what extent do they address the long-term structural problems in the sector?

Table 1: Changes in Key Production Indicators: 2001/02 – 2003/04

Variables (N=441)	2002 Means	2004	% change
Cocoa production (Kgs.)	1,268	1,686	0.33
Land under cocoa for each farmer (ha)	6.26	7.49	0.2
Cocoa yields (Kgs./ha)	255.11	274.27	0.08
% tree stock too young to produce	19	21	2
% tree stock in full production	77	55	-22
Total person days labour on cocoa	325.1	712.95	1.19
% hired labour	56	39	-18
Kg fertiliser used	24.35	256.85	9.55
% farmers using fertiliser	9	48	39
Litres insecticides	11.73	9.15	-0.22
% farmers using insecticide	72	95	23
Real value cocoa equipment (2002 'ooo Cedis)	483	1,944	3.02
Awareness of smuggling sales across IC border*	0.24	0.84	0.6
Average monthly rainfall (ml.)	89.92	116.1	0.29
% producer spraying their farms	82	99	17
% farmers investing in cocoa expansion	48	46	-2
% of farmers investing in cocoa replanting	48	39	-9

Source: Author's calculation based on GCFS 2002, GCFS 2004.
* This reflects whether the respondent was aware of Ghanaians selling their cocoa to Ivory Coast in 2002 (smuggling out), and Ivorian selling their cocoa in Ghana in 2004 (smuggling in).

The survey

In 2002, the Ghana Cocoa Farmers Survey (GCFS) surveyed 497 farmers to measure production, productivity and marketing choice indices in the three prominent cocoa producing areas of southern Ghana (Ashanti, Western and Brong Ahafo); this survey was repeated with 441 of the same farmers during October-November 2004. Changes in the sector as a whole were not entirely reflected by the changes observed in the sample surveyed (see Teal et al., 2006 for more detail on this). Thus, the data used in the present analysis show a production increase lower than that reported in the aggregate. However, the composition of this growth episode as described in the data is wholly consistent with what is known in the aggregate: two-thirds of the increase in production was generated from the extensive land margin, while the other third was obtained by intensifying the productivity of existing land under cocoa cultivation. This important feature of the survey data enabled us to undertake an empirical analysis on the 2-year panel, with the aim of offering insights into the cause of the expansion in production.

The results

The changing profile of cocoa farmers in Ghana

Cocoa production is characterised by low-technology cultivation, which requires the use of working capital mainly to hire labour for clearing and weeding the land, and to purchase the chemicals needed to spray cocoa farms for the control of pests and diseases.

The young and the better educated tend to leave cocoa farming and the rural areas, to migrate to urban areas in search of better job opportunities. Data collated from various sources (various rounds of the Ghana Living standards Survey and the GCFS) suggest that a characteristic cocoa-growing household is headed by men (80% of population) in their late 40s (average age 49 years), with primary level education (on average 6 years).

Ghana's cocoa belt lies in the south of the country. The three regions covered in the survey are a representative cross-section of the geographical variation in the cocoa belt. Ashanti is the traditional cocoa-growing area; the south of Brong Ahafo represents the agro-ecological zone where the cocoa belt is moving into by extension of the dry savannah areas of the Northern regions. Finally, the Western regions are the new areas of production for the tree crop. These have become important since the 1970s and because of the proximity to the Ivorian border

they also represent areas of major smuggling activities.

Table 1 shows the key indicators for total cocoa production analysis. The labour employed on cocoa farms has more than doubled over this period. However, this change was predominantly driven by an increase in the household component of the rural work force. The average amount of fertiliser used by farmers is 9.5 times higher (with 39% more farmers using it). The share of cocoa farms lost to black pod, a fungal disease, has almost disappeared in the sample (from 35% in 2001–02 to just 0.27% in 2003–04). Two potential sources of production changes unrelated to farmers' choices were a favourable rainfall pattern in the months preceding the 2003-04 main harvest, and speculation about a significant increase in reverse smuggling of cocoa into Ghana from neighbouring Ivory Coast (in 2004 80% of farmers reported awareness of Ivorians smuggling their cocoa across the border). Finally, nearly all smallholders surveyed in 2004 reported spraying their farms (up from 81% of respondents adopting this practice in 2002): the average number of applications was the recommended 4.22, with just under half of these (46%) by the government.

Determinants of cocoa-production growth

Figure 2 shows the size effects of all variables used to estimate the determinants of cocoa production growth.

The amount of land cultivated greatly affected production —a 0.5% increase in production for each 1% increase in farm area dedicated to cocoa. Labour and fertiliser use had similar size effects (0.09% and 0.07% increase in growth for each 1% increase in their input use). Regionally, there was a strong indication that the increase in production was concentrated in the Northern Western Region (the Sefwi area), which is consistent with what is known about the dynamics of production in this area. Of the two exogenous drivers of growth, the analysis suggests a positive and significant effect of rainfall on the crop, but no significant effect of smuggling to and from Ivory Coast (not shown), although this could be because the variable used to measure this effect is a poor proxy for smuggling.

The extensive use of spraying machines had also increased production. This result was further reinforced when allowing for the cocoa acreage lost to black pod. The negative impact of the disease on production was significantly lower on farms sprayed with fungicide. Finally, there was a drop in the overall factor productivity: when looking at total factor productivity, we see a substantial fall over the production growth period.

Cocoa yields

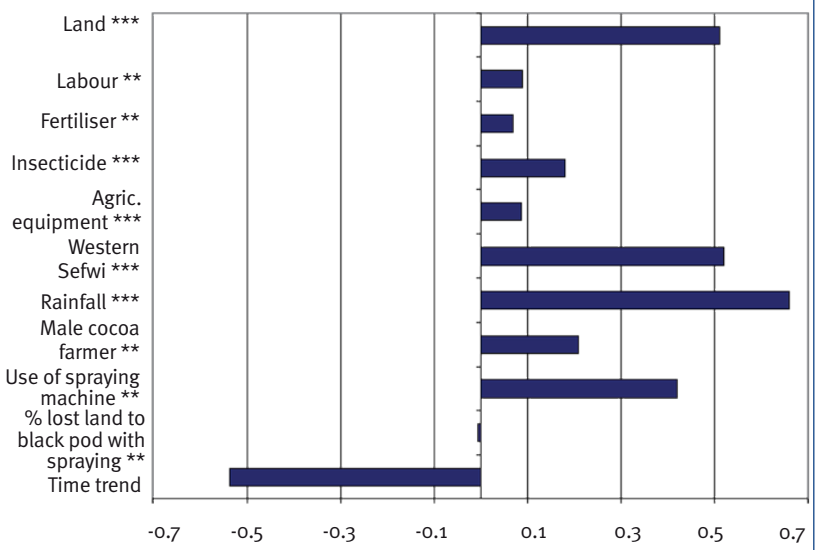
Increases in yields are often viewed as a proxy indicator for smallholders' efficiency. An inverse relation between the amount of cocoa produced on each unit of land and the labour input per hectare, and the size of the farm would suggest that higher levels of input productivity are obtained on smaller farms. Such a conclusion, if supported by the data, has important policy implications for how best to promote the efficient allocation of inputs in smallholders' agricultural production.

Figure 3 shows data on land productivity according to quartiles of farm size, survey years, and regional distribution. Two clear messages can be drawn from this representation. First, yields have clearly increased across time, and across all regions. However, this positive increase has not boosted the productivity of land under cocoa cultivation in Ghana to any noticeable degree: cocoa yields in the country remain low by comparative international standards: with an average of just under 400 kg/hectare on full bearing farms (farms with tree stock of 10–15 years old).

Second, there was a negative relationship between yields and farm size. The total amount of labour employed by each farmer has more than doubled over the period of the study. We also know that this increase reflected primarily a rise in the household labour share of employment on cocoa farms. The price of rural (hired) labour to the farmer rose substantially over this period, leading small farmers to use more intensively household workers (at lower implied costs).

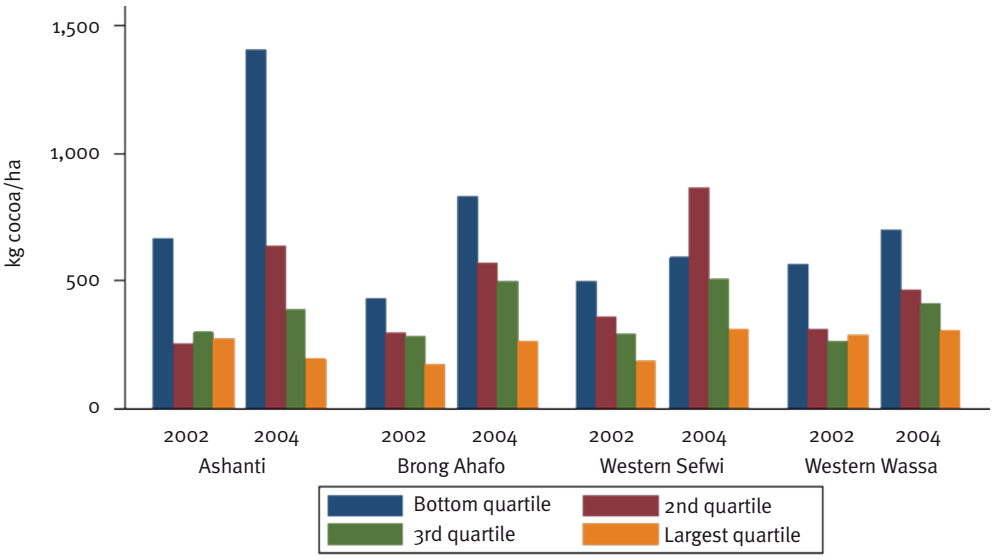
Thus, these results can be combined with the survey's initial findings to indicate how Ghanaian cocoa farmers responded to the dramatic rise in the price incentives from 2002 onwards. Most of the rise in output came from increased land area, not increased land productivity (yields). The extent to which the latter has taken place is wholly reconcilable with: (i) a more intensive use of (household) labour;

Fig 2: The Determinants of Cocoa Growth between 2001 and 2003 (Fixed Effect Model)



Legenda: *, **, *** are different levels of statistical significance: respectively 10%, 5%, 1%.

Fig 3: The role of farm size for land productivity - Cocoa yields by farm size quartile from 2001 to 2003 (full bearing tree stock only)



Source: Author's calculations based on 2001 and 2003 panel data

(ii) a good rainfall pattern; and (iii) the effectiveness of farm spraying and increased fertiliser use. Finally, while this issue remains speculative at present, it is clear from the analysis of survey data that the underlying problem facing the cocoa sector is farmers' lack of innovation in their technology of production.

Policy conclusions

The adoption of substantially higher fertiliser rates in conjunction with a systematic spraying of cocoa farms has played a key role in showing the potential of market incentives (in the form of higher producer prices on the one hand, and a combination of subsidised inputs and better farming practices promoted by the government on the other) in making possible what is considered a miracle growth episode.

We should be careful not to overstate Ghana's cocoa success story in the early 2000s. First, it appears that factors outside of farmers' production choices have been underestimated in their contribution to the doubling of production: good rainfall, and smuggling from Ivory Coast, though the latter remains purely speculative with the data available at present. Second, it would be short-sighted to view this growth episode as easy to replicate at no cost for other aspects of the functioning and long-term sustainability of the sector. We have seen that cocoa yields, though characterised by a positive trend, have not changed substantially, and this poses more fundamental questions about how the long-term productivity of land under cocoa cultivation can be raised: investment rates in replanting and tree rehabilitation remain low (as shown in Table 1), and this is symptomatic of a sector that still lags behind in its appreciation to finance and/or subsidise the rehabilitation of its tree stock rather than to promote the continued expansion into new forest areas.

References

Teal, F., Zeitlin, A. and Maamah, H. (2006) *Ghana Cocoa Farmers Survey 2004: Report to Ghana Cocoa Board*. Centre for the Study of African Economies, Oxford University (http://www.gprg.org/pubs/reports/pdfs/2006-04-teal-zeitlin-maamah.pdf).

Photo credit: R. Venugopal

Project information

This project aims to assess whether the marketing system currently prevailing in Ghana's cocoa sector has been beneficial to cocoa farmers. This is done by means of 1) analysing primary data collected on a panel of farmers in 2002 and 2004; and 2) discussing the policy implications of the research findings for the sector as a whole: how effective has the marketing system been in providing the right incentives to farmers to sustain total production and yields?

The survey on which the analysis of this brief is based was designed and first undertaken in 2002 when Marcella Vigneri was at Oxford University leading the DFID funded project 'Coping with Agricultural Reforms in the 1990s: The case of cocoa farmers in Ghana'. Subsequently, in 2004, a team from the Centre for the Study of African Economies (Oxford University) resurveyed 441 farmers from the original sample with funding from the Global Poverty Research Groups.

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